

BCI 3303 Oximeter

Service Manual



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Chapter 1: Warranty & Service Information

Proprietary Notice

Information contained in this document is copyrighted by BCI International and may not be duplicated in full or part by any person without prior written approval of BCI International. Its' purpose is to provide the user with adequately detailed documentation to efficiently install, operate, maintain and order spare parts for the device supplied. Every effort has been made to keep the information contained in this document current and accurate as of the date of publication or revision. However, no guarantee is given or implied that the document is error free or that it is accurate regarding any specification.

Limited Warranty

BCI International warrants each new device to be free from defects in workmanship and materials under normal use and service for a period of two (2) years from the date of shipment, and reusable probes for a period of one (1) year from shipment (domestic sales only). BCI International's sole obligation under this warranty will be to repair or replace, at its option, products that prove to be defective during the warranty period. The foregoing shall be the sole warranty remedy. Except as set forth herein, seller makes no warranties, either expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. No warranty is provided if the products are modified without the express written consent of BCI International, and seller shall not be liable in any event for incidental or consequential damage. This warranty is not assignable.

Loaner Device

BCI International will for the period of warranty make available at no charge, loaner devices if, in BCI International's opinion, the repair of the customer's device would require an unreasonable period of time.

Service Support

Repairs of BCI International's devices under warranty must be made at authorized repair centers. If the device needs repair, contact BCI International's service department to request a customer service report number (CSR). When calling, have the device's model and serial number ready.

NOTE! Shipments received without a CSR number will be returned to sender.

If you need to ship the device, pack the device and accessories carefully to prevent shipping damage. All accessories should accompany the device.

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Chapter 2: Warnings, Cautions, & Notes

A *warning* tells you about something that could hurt the patient.

A *caution* tells you about something that could damage the monitor.

A *note* tells you other important information.

Warnings

WARNING! Federal law (USA) restricts the use or sale of this device by, or on the order of a physician.

WARNING! Do not use this device in the presence of flammable anesthetics.

WARNING! Do not use this device in the presence of magnetic resonance imaging (MR or MRI) equipment.

WARNING: This device must be used in conjunction with clinical signs and symptoms. This device is only intended to be an adjunct in patient assessment.

WARNING! Reposition the probe at least once every 4 hours to allow the patient's skin to respire.

WARNING! When attaching probes with Microfoam®¹ tape, do not stretch the tape or attach the tape too tightly. Tape applied too tightly may cause inaccurate readings and blisters on the patient's skin (lack of skin respiration, not heat, causes the blisters).

Cautions

CAUTION! The monitor is equipped with an internal rechargeable battery. Do not attempt to remove or replace the internal rechargeable battery. Refer servicing to an authorized repair center.

CAUTION! Do not autoclave, ethylene oxide sterilize, or immerse the probes in liquid.

CAUTION! This device is intended for use by persons trained in professional health care. The operator must be thoroughly familiar with the information in this manual before using the device.

CAUTION! Connect only the printer cable specifically intended for use with this device (see *Optional Supplies and Accessories*).

¹ Microfoam® is a registered trademark of the 3M Company.

Notes

NOTE! Operation of this device may be adversely affected in the presence of strong electromagnetic sources, such as electrosurgery equipment.

NOTE! Operation of this device may be adversely affected in the presence of computed tomograph (CT) equipment.

NOTE! Use only SpO₂ probes supplied with, or specifically intended for use with, this device.

NOTE! SpO₂ measurements may be adversely affected in the presence of high ambient light. Shield the probe area (with a surgical towel, for example) if necessary.

NOTE! Dyes introduced into the bloodstream, such as methylene blue, indocyanine green, indigo carmine, and fluorescein, may adversely affect the accuracy of the SpO₂ reading.

NOTE! Any condition that restricts blood flow, such as use of a blood pressure cuff or extremes in systemic vascular resistance, may cause an inability to determine accurate pulse rate and SpO₂ readings.

NOTE! Remove fingernail polish or false fingernails before applying SpO₂ probes. Fingernail polish or false fingernails may cause inaccurate SpO₂ readings.

Chapter 3: About This Manual

This manual contains circuit descriptions, voltage and waveform test points, detailed parts lists, and circuit diagrams for the oximeter and the charging base. It is intended for persons trained in service, maintenance, and repair of modern medical equipment. Thorough knowledge of this equipment's operation is required before attempting to repair this equipment.

The remainder of the manual is divided into these sections:

- **Oximeter Circuit Description.** Contains circuit descriptions, voltage test points, and waveform test points for the oximeter and display board.
- **Parts Lists & Circuit Diagrams.** Contains detailed parts lists and circuit diagrams for the oximeter and charging base.

Chapter 4: Oximeter Circuit Description

Functional Structure

The functional structure of the oximeter is shown in drawing no. 72042S1. The oximeter consists of the main board, the display board, the key label, and the battery:

- The oximeter board contains the battery charger, power supplies, the on/off control logic, the microprocessor, and the data acquisition circuitry.
- The display board contains the 7-segment displays, the led bar graph, the indicator lights, LED driver chip, and the speaker circuitry. The display board connects to the main board through an eight-conductor cable.
- The key label contains the front panel touch keys and two LED's.

Battery Charger

General Description

The wall mount charger has an unregulated 24 V DC output that comes into the main board at J5. Transorb D8 prevents electrostatic discharges from entering the system. The charger circuit converts the input voltage to charge current with a step down buck converter made up of Q17, D7, L2, and U28. The actual current control is maintained by the MAX713 (U27) by monitoring the voltage generated across R87,R93. This voltage is regulated to 250 mV during fast charge and 31 mV during trickle charge. This results in a charge current of 312 mA during fast charge and a 39 mA trickle charge. The power used by the system for the processor, display board etc., is returned to ground rather than -V BATT. This results in the battery charge current being constant regardless of the system load. The batteries charge just as fast with the unit powered up as when its turned off. The product uses 850 mA batteries and so the charge current is $312/850+0.36C$ and will take about 3-4 hours to perform a full charge.

The MAX713 is powered by dropping the input voltage to 5 V through the resistors R79/R80. The chip has an internal 5 V zener between the V+pin and ground. As stated earlier the MAX713 monitors the voltage at -V BATT to regulate the charge current. The DRV pin (U27-14) is the control output and is used to adjust the input control voltage of the pulse width modulator made up of U28A and B. The MAX 713 has a maximum rating of 16 V on the DRV pin and so D11, R83, Q19 make up a small 12 V regulated supply to run the PWM circuitry. U28B is wired as a free running 220Khz astable multivibrator. The output (U28-9) is fed to U28A to control the duty cycle of the signal driving the FET (Q17). C87 is used to AC couple the drive signal to the FET so that in the event of a failure of U28 the FET is protected from a full on condition.

U27-8 goes low whenever the MAX713 is in fast charge mode. The rating on this line is 12 V maximum so D12 is used to protect the chip from damage. When fast charge is active U27-8 turns on Q18 which lights up the yellow LED on the key label. The green LED on the key label is lit whenever the input power is plugged in and the charger is supplying current.

Battery Protection

D9 prevents discharge of the battery when input power is disconnected. The MAX713 has an internal mechanism for isolation from the battery when no power is available.

The MAX713 also provides thermal protection of the battery. The battery pack contains a thermal fuse set at 70°C and a 10K thermistor with a tempco of -4.41%/°C. The thermistor is connected between pins 2 and 3 of the battery pack. The MAX713 has a 2.00 V reference at U27-16 which is divided down to 535.5 mV at TP29. This voltage is used with an internal comparator at U27-6 (TLO) to prevent battery damage caused by fast charging a cold battery. Another comparator at U27-5 is used to stop fast charging the battery if it gets too hot. Battery temperatures below 10°C will cause the battery to be trickle charged until warm. If the battery gets above 47°C fast charge ceases.

Oximeter On/Off Control

- When the oximeter is off and the ON key is pressed U13-5 is shorted to ground, which causes flip-flop output U13-3 to go low and output U13-6 to go high, which in turn enables the power supply converter U29.

There are two ways the oximeter can be turned off:

- When the OFF/STBY key is pressed.
- When the Power Fault Output signal (/PFO), generated by the power monitor/watchdog chip U25, goes low.

When either the OFF/STBY key is pressed or the signal /PFO goes low:

- Flop output U13-3 goes high and output U13-6 goes low, turning off the power supply converter U29.

System Power Supply

A low power linear 5 V regulator (U30) is used to supply continuous power to the RAM, when the unit is turned off. This V-RAM supply also provides power to the ON/OFF circuitry.

The main power supply is built around U-29, a pulse width modulated switch mode buck converter. The transformer T1 is used as a power inductor in the buck converter generating +5 VDC, and as a fly back transformer to generate low power -5 VDC.

Microprocessor Circuit

A standard microprocessor core is formed by microprocessor U14, PROM U18, and RAM U19. Crystal X11, C53, and C54 form the oscillator circuit. The microprocessor's PHI output at U14-71 is one-half of X11's frequency.

Reset Circuit

Watchdog timer chip U25 performs three functions:

- RESET is generated by U25 if VCC is less than +4.4 VDC.
- NMI (non-maskable interrupt to microprocessor) is generated by U25 if the signal /WDT is not strobed within 1.6 seconds.
- /PFO (power fail output) is generated by U25 if the input PFI at U25-4 becomes less than 1.25 VDC. /PFO turns off the oximeter through U13B, Q10, and Q15.

Gates U13C and U13D disable access to RAM chip U19 while RESET is active.

Memory and I/O Decoding

Demultiplexer U17B decodes A16, A17, and ME to allocate memory space. The following chart shows the memory address allocation:

FROM	TO	ENABLED DEVICE
00000H	0FFFFH	PROM U18.
10000H	1FFFFH	RAM U19.
20000H	2FFFFH	A/D U21 read and chip select strobe.
30000H	3FFFFH	A/D U21 start conversion strobe.

Demultiplexer U17A decodes A6, A7, and IOE to allocate I/O space. The following chart shows the I/O address allocation:

FROM	TO	SIGNAL OR ENABLED DEVICE
00H	3FH	not used (64180 microprocessor internal I/O address space).
40H	7FH	DAC-LD load strobe to U7.
80H	BFH	/KEYRD strobe to U22 and LATCH gate strobe to U16.
C0H	FFH	DSP-LD strobe to display board U1 and /WDT strobe to U25.

Addressable Latch

Addressable latch U16 decodes A0-A3 and provides 9 outputs for controlling the oximeter board's circuitry. The following chart shows the output addresses for LATCH (80-8FH) and the functions for each output address:

OUTPUT ADDRESS	SIGNAL AND DESCRIPTION
80H 81H	CAP-GND shunt inactive. CAP-GND shunt active.
82H 83H	RED-DRV (red LED) off. RED-DRV (red LED) on.
84H 85H	IR-DRV (infrared LED) off. IR-DRV (infrared LED) on.
86H 87H	RST-INT (integrator reset) off. INTGRAT (integrator) on. RST-INT (integrator reset) on. INTGRAT (integrator) off.

OUTPUT ADDRESS	SIGNAL AND DESCRIPTION
88H 89H	MUX-A = 0 MUX-A = 1
8AH 8BH	MUX-B = 0 MUX-B = 1
8CH 8DH	LOUDCTL = speaker soft. LOUDCTL = speaker loud.
8EH 8FH	QUIET = on. QUIET = off.

Synchronous Serial Port

The microprocessor's synchronous serial port TXS/CKS is used to send data to the adjustable gain voltage to current converter U7 and to send data to the display driver chip U1. U7's data is latched with the I/O strobe DAC-LD; display driver chip U1's data is latched with the I/O strobe DSP-LD.

Asynchronous Serial Port

The microprocessor has two internal asynchronous serial ports: TXA0/RXA0 and TXA1/RXA1. TXA0/RXA0 is used for manufacturer test and OEM interface applications. TXA1/RXA1 is used for sending printer data to the printer through RS-232 converter U26. If the oximeter probe is connected, logical low state of signal PRB - DET disables U26. When the probe is unplugged, communication is enabled through pins 4 and 8 of patient probe connector.

TXA0 at U17-48 is buffered by U15D and routed to JP2. RXA0 is buffered by U15E and routed to U14-49.

Speaker Output

Microprocessor output A18 (TOUT) is configured as a timer output and controls the tone of the pulse beep speaker.

Keypad Interface

Gate U22 (/KEYRD, input address 80H) provides 8 inputs for reading the oximeter's keys and checking the state of the PRB-DET signal. The following chart shows the possible conditions for each input:

ADDRESS 80H INPUT BIT	SIGNAL AND DESCRIPTION
D0	0 = PRB-DET not true (probe not connected to oximeter). 1 = PRB-DET true (probe connected to oximeter).
D1	0 = Spotck not true (I.D./CLEAR key not pressed). 1 = Spotcktrue (I.D./CLEAR key pressed).
D2	0 = Spotck not true (I.D./CLEAR key not pressed). 1 = Spotcktrue (I.D./CLEAR key pressed).
D3	0 = Up not true (UP ARROW key not pressed). 1 = Up true (UP ARROW key pressed).
D4	0 = Down not true (DOWN ARROW key not pressed). 1 = Down true (DOWN ARROW key pressed).
D5	0 = BeepV not true (PULSE VOL key not pressed). 1 = BeepV true (PULSE VOL key pressed).
D6	0 = AlmVol not true (ALARM VOL key not pressed). 1 = AlmVol true (ALARM VOL key pressed).
D7	0 = AlmSil not true (ALARM SILENCE key not pressed). 1 = AlmSil true (ALARM SILENCE key pressed).

Analog Demultiplexer

Analog multiplexer U6 routes one of four possible analog inputs to a single output. The signals MUX-A and MUX-B from addressable latch U16 control which input gets routed to U6's output as shown in the following chart: (For the addresses of these signals, see earlier in this section *Addressable Latch*.)

SIGNAL	MUX-B	MUX-A	U6 INPUT
A-Ground	0	0	X0
V-REF	0	1	X1
V-A	1	0	X2
V-BATT	1	1	X3

The output of U6 is buffered by U2B then amplified ($A_V = -5$) by U2A. The output of U2A (SIGNAL at TP9) is routed to the input of the ADC.

A/D Converter

A/D converter (ADC) U21 is configured as a 12-bit ADC. The ADC's input voltage comes from SIGNAL at TP9. The ADC's reference voltage output, 3.00 VDC, is used by the analog circuitry. The following sequence describes an ADC conversion cycle:

- Write to memory address 30000H (/ADCST) to pulse low U21-27. This pulses the ADC's /CONVST (start conversion) input to begin the conversion cycle.
- Wait 10 μ sec, then read memory address 20000H for the low order 8 bits of the 12-bit conversion. Read memory address 20001H for the high order 4 bits of the 12-bit conversion.

LED Drive

The red LED drive circuit is formed by Q4, Q2, Q5, and their associated discrete components. When the signal RED-DRV is pulsed high, Q4 turns on, which turns on Q2 and Q5. While Q2 is on, current flows from ANA+5V through Q2, through J1-3 to the anode of the red LED, through J1-2 from the cathode of the red LED, through Q5, through R22, to ground. Q5 provides a constant current sink by D2 at Q5-base and R22 at Q5-emitter.

The infrared (IR) LED drive circuit is formed by Q3, Q1, Q6, and their associated discrete components. When the signal IR-DRV is pulsed high, Q3 turns on, which turns on Q1 and Q6. While Q1 is on, current flows from ANA+5V through Q1, through J1-2 to the anode of the IR LED, through J1-3 from the cathode of the IR LED, through Q6, through R27, to ground. Q6 provides a constant current sink by D1 at Q6-base and R27 at Q6-emitter.

Signal Processing

The differential transconductance amplifier formed by U8 and U9 converts the photodetector's current output to a voltage at TP7 (V-AMB). Unity gain amplifier U3A offsets the signal at TP7 so the signal baseline is at 3 VDC. This allows a wider signal range for the negative-going pulses at TP7.

V-AMB is passed through blocking capacitor C14 to remove the signal's DC component, then the signal is buffered by U3B. The output of U3B is routed to adjustable gain, voltage to current converter U7. The microprocessor determines the appropriate gain for the signal, then loads this value into U7 with the signals TXS, CKS, and DAC-LD. The output of U7 is routed to current to voltage converter U4. (Note that U1B "zeros" the output of U4 for the time while no signal of interest is present at U4; this prevents U4 from saturating.)

U4's output is integrated and filtered by U1A, and is routed to amplifier U2A. U2B passes V-REF to TP8 and to the input of U2A to sum V-REF with the signal from U1A. The output of U2A (SIGNAL at TP9) is routed to the ADC for measurement.

Display Board

The display board contains the LED display driver chip, the 7-segment displays, the LED bar graph, and the speaker circuit. The display board is interfaced to the oximeter board through an 8-conductor flexible strip cable.

Display Circuitry

The display driver chip U1 receives synchronous data from the microprocessor's TXS and CKS lines. The data is loaded with the I/O strobe DSP-LD.

U1 generates electrical noise that might cause inaccurate measurements from the ADC. For this reason, U1 is turned off for 2 msec out of 8 msec (during the data acquisition time). The signal BLANK turns off U1.

U1 controls the 7-segment displays and the LED bar graph according to the data it receives from the TXS serial channel. The brightness of the displays is controlled by the I-SET input at U1-18. The display's brightness is adjusted by allowing or preventing current to flow through R2 and D4, D5, or D6.

Speaker Circuitry

Speaker circuitry consists of pulse frequency modulator built around U2, and current switch Q1.

U2A creates a high frequency (approximately 50 kHz.) oscillator with variable duty cycle and period. Duty cycle and period are controlled by the signal LOUDCTL. If LOUDCIL is at logic "zero", then U2C gate increases discharge current through C4, which makes the total period shorter. C4 charging current, stays constant and is defined by resistor R3. That is why changing the period affects the duty cycle of the oscillator, too.

Oscillator is strobed by TONE signal.

The output of the oscillator controls a current switch Q1. Changing duty cycle on this switch changes the amount of power supplied to the 8 ohm speaker, and, in turn, volume of the sound.

Signal Dictionary

This section lists in alphabetical order the signal names used on the schematics. The signal's origin, destination, and purpose are described.

Oximeter Board

SIGNAL	DESCRIPTION
A0-A17	A0 through A17 are the microprocessor's address lines. A0-A17 are used to address the RAM, PROM, and I/O ports.
A18	Microprocessor output A18 (TOUT) is configured as a timer output and controls the tone of the optional pulse beep speaker.
ANA+5	The +5 volt power supply VCC is filtered to produce ANA+5. ANA+5 powers the analog circuitry.
ANA-5	The -5 volt power supply is filtered to produce ANA-5. ANA-5 powers the analog circuitry.
VBAT+	Connects to 9.6-volt rechargeable battery "+" terminal.
VBAT-	Connects to 9.6-volt rechargeable battery "-" terminal.
CAP-GND	CAP-GND originates at addressable latch U16 and is routed to analog switch U5. When CAP-GND is on, the blocking capacitor C14 is shunted to ground; this action sets the baseline of V-AMB to ground before data acquisition.
CKS	CKS is the microprocessor's high-speed, synchronous serial output clock signal. CKS is routed to two serial clocked devices: the display board's driver U1 and the adjustable gain, voltage to current converter U7.
D0-D7	D0 through D7 are the microprocessor's data lines. The data lines are routed to RAM, PROM, and ADC U21.

SIGNAL	DESCRIPTION
DAC-LD	DAC-LD originates at decoder U17A. DAC-LD is routed to the serial clocked, adjustable gain, voltage to current converter U7. When DAC-LD is strobed, U7 loads data from TXS.
DSP-LD	DSP-LD originates at decoder U17A. DSP-LD is routed to the display board's driver U1. When DSP-LD is strobed, U1 (on the display board) loads data from TXS.
FLTR+5	The ANA+5 power supply is filtered to produce FLTR+5. The FLTR+5 supply powers the photodetector's first stage amplifier.
FLTR-5	The ANA-5 power supply is filtered to produce FLTR-5. The FLTR-5 supply powers the photodetector's first stage amplifier.
INTGRAT	INTGRAT originates at addressable latch U16 and is routed to analog switch U5. When INTGRAT is on, the signal at TP6 is integrated by U1A. When INTGRAT is off, the signal at TP6 is not allowed to pass to the integrator, and the integrator is reset by the action of RST-INT.
IR-DRV	IR-DRV originates at addressable latch U16 and is routed to the infrared LED drive circuit at Q3. When IR-DRV is pulsed on, the probe's infrared LED is pulsed on.
/KEYRD	Strobe to U22 (input address 80H) that loads the state of the key switches and the PRB-DET signal onto the data bus.
LATCH	LATCH originates at decoder U17A and is routed to addressable latch U16. LATCH loads and latches the state of A0 for the Q output specified by A1 through A3.
ME	ME is the microprocessor's memory enable output. ME is routed to decoder U17B to enable memory decoding.
MUX-A	MUX-A originates at addressable latch U16 and is routed to analog demultiplexer U6 "A" input.
MUX-B	MUX-B originates at addressable latch U16 and is routed to analog demultiplexer U6 "B" input.
OFF-INT	OFF-INT originates at the on/off flip-flop formed by U13A and U13B and is routed to the microprocessor's INT1 (interrupt 1) input. When the OFF/STBY key is pressed, OFF-INT goes low, generating an interrupt request at the microprocessor. The microprocessor responds to the interrupt by performing several "housekeeping" tasks before the oximeter turns off.
OFFS-NULL	OFFS-NULL originates at U14-45 (microprocessor RTS0 output) and is routed to analog switch U5. When OFFS-NULL is on (between data acquisition periods), the output of U4 is zeroed by U1B. This prevents U4 from saturating during data acquisition.
ON	ON originates at the ON key and is routed to the on/off control circuit. ON is pulled to V-RAM through R29. While the ON key is pressed, the signal ON goes low. This turns on Q10 and Q15, which turns on the voltage to the regulator chips.

SIGNAL	DESCRIPTION
/PFO	/PFO (power fail output) is generated by U25 if the input PFI at U25-4 becomes less than 1.25 VDC. /PFO turns off the oximeter through U13B, Q10, and Q15.
PRB-DET	PRB-DET originates at the probe connector and is routed to input gate U22-2. The probe's connector has pins 1 and 6 shorted, so pin 1 (PRB-DET) is pulled to ground while the probe is connected. The voltage level at PRB-DET is read at input port 80H, bit 0 to determine if the probe is connected (logic level 0) or if the probe is not connected (logic level 1).
/Quiet	/Quiet originates at addressable latch U16; /Quiet is routed to the display board's driver U1. /Quiet turns the displays during the data acquisition time (2 msec out of 8 msec total).
RD	RD is the microprocessor's read signal. It is routed to PROM and RAM.
RED-DRV	RED-DRV originates at addressable latch U16 and is routed to the red LED drive circuit at Q11. When RED-DRV is pulsed on, the probe's red LED is pulsed on.
RST-INT	RST-INT originates at addressable latch U16 and is routed to analog switch U5. When RST-INT is on, the integrator output at U1A is reset. When RST-INT is off, the signal at TP6 is integrated by U1A.
RXA0	Routed to JP2 for use with manufacturer and OEM interface applications.
RXA1	Input to IR-transistor Q13; this is the data from the printer.
SIGNAL	SIGNAL originates at TP9 and is routed to ADC U21's VIN input. Depending on the state of the analog demultiplexer U6, SIGNAL represents either GROUND, V-REF, V-BATT, or the probe signal.
STBY	SBTY originates at the OFF/STBY key and is routed to the on/off control circuit. STBY is pulled to V-RAM through R34. While the OFF/STBY key is pressed, the signal STBY goes low. This turns off Q10 and Q15, which turns off the voltage to the regulator chips. OFF-INT goes low, too.
TXA0	Routed to JP2 for use with manufacturer and OEM interface applications.
TXA1	Output to IR-diode Q10; this is data that is sent to the printer.
TXS	TXS is the microprocessor's high-speed, synchronous serial output transmitted data signal. TXS is routed to two serial clocked devices: the display board's driver U1 and the adjustable gain, voltage to current converter U7.

SIGNAL	DESCRIPTION
V-AMB	V-AMB (TP7) originates at the output of amplifier U9. V-AMB is routed to blocking capacitor C14. The DC level of V-AMB represents the fixed offset (3.00 VDC) minus the amount of light sensed by the photodetector. V-AMB is the same signal as V-A; V-A is routed to analog demultiplexer U6. V-A is measured by the ADC then tested to determine if U9 is saturated.
V-RAM	The V-RAM supply powers the CMOS RAM chip and the oximeter on/off control circuit while the monitor is off and on.
V-REF	V-REF originates at the REFOUT pin of ADC U21 and is routed to two circuits: the fixed-offset driver formed by U3A and the analog demultiplexer U6.
VCC	VCC is the regulated +5 VDC supply generated by +5 volt power supply regulator chip U26 and its discrete components.
VDD	Same as VCC.
VSS	Digital ground.
WR	WR is the microprocessor's write signal. It is routed to RAM.

Display Board

SIGNAL	DESCRIPTION
/BLANK	Same as oximeter board /QUIET.
CKS	Same as oximeter board CKS.
DIG1-DIG5	DIG1 through DIG8 originate at display driver U1 and are routed to the common cathode pins of the seven-segment LED displays DS1 through DS10. DIG1 is pulsed low to turn on the segments at DS1 represented by Sa-Sg. This is repeated for DIG2 through DIG8; then DIG1 is pulsed again. The entire cycle is controlled by display driver U1 as it receives data from the microprocessor's CKS signal.
DSP+	DSP+ originates at the output of the +5 volt power supply regulator chip U26. DSP+ powers the display driver U1.
DSP-LD	Same as oximeter board DSP-LD.
LOUDCT L	Output from addressable latch U16 on the oximeter board. When logic level 0, speaker volume is low. When logic level 1, speaker volume is high.
Sa-Sg	Sa-Sg originate at display driver U1 and are routed to the seven-segment displays and the led bar graph. The state of Sa through Sg determine which display or bar graph segments light when the corresponding DIG signal is strobed.
TONE	Output from microprocessor's TOUT pin 31. Controls the tone of the speaker.
TXS	Same as oximeter board TXS.

Test Equipment and Tools Required

To diagnose and repair the full extent of possible malfunctions on the oximeter and display board, you'll need the following test equipment and tools:

- DMM, volts/ohms/amps, with $10\text{ M}\Omega$ input impedance or greater
- Oscilloscope, 50 MHz, with $10\text{ M}\Omega$ input impedance or greater
- AC Power Supply
- Small Phillips screwdriver
- Small flat blade screwdriver
- Needle nose pliers
- Diagonal cutters
- Clip leads
- Low-power microscope or magnifying glass
- Soldering iron and solder
- Solder wick or solder remover

Voltage Test Points

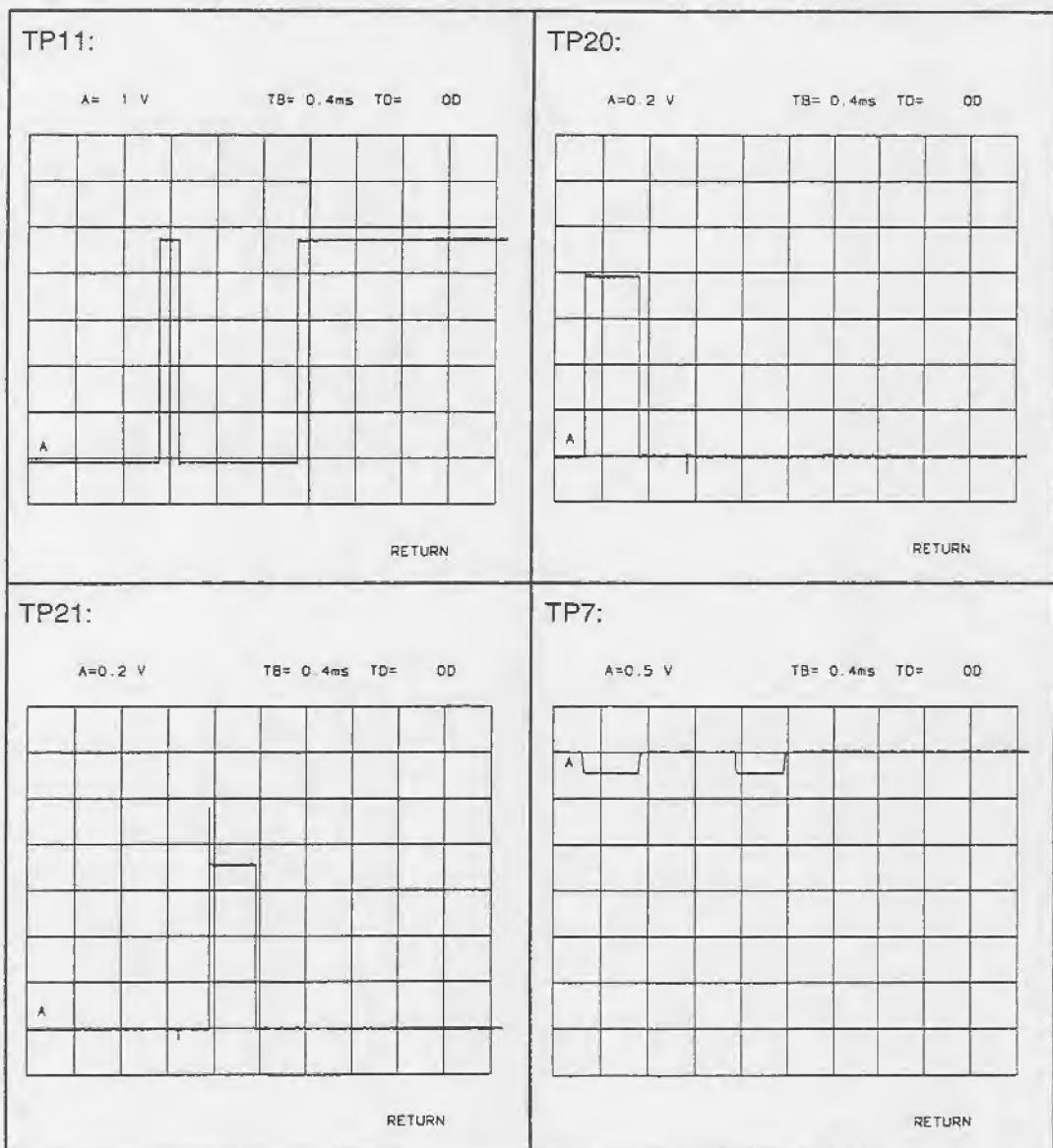
Unless otherwise noted, all voltages are measured with respect to ground at TP-16.

LOCATION	CONDITION	NOMINAL AND RANGE
TP14	Oximeter on.	5 VDC, ± 0.25 VDC
ANA+5	Same as TP14.	Same as TP14.
FLTR+5	Same as TP14.	Same as TP14.
TP15	Oximeter on.	-4.8 VDC to -6.2 VDC
ANA-5	Same as TP15.	Same as TP15.
FLTR-5	Same as TP15.	Same as TP15.
V-REF	Oximeter on.	3.00 VDC
V-RAM	Oximeter on.	5VDC, ± 0.25 VDC.
U14-71	Oximeter on.	6.144 MHz, 50% duty cycle.
TP26	AC Power Supply on.	12.0 ± 1.0 V
TP27	AC Power Supply on.	9.0 to 14.0V depends on the state of the battery charge.
TP28	AC Power Supply on.	250 ± 50 mV unless in trickle charge mode.

Waveform Test Points

The following oscilloscope screens show typical waveforms from the probe detector's amplifier and data acquisition circuits. Unless otherwise noted:

- The waveforms are measured with respect to ground at P1-2.
- The oscilloscope is triggered on TP11, falling edge.
- The waveforms are measured with the finger probe attached to the oximeter with finger or piece of paper in probe.

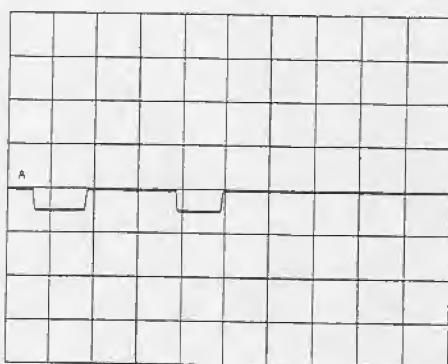


Chapter 4: Oximeter Circuit Description

TP18:

A=0.5 V

TB= 0.4ms TD= 0D

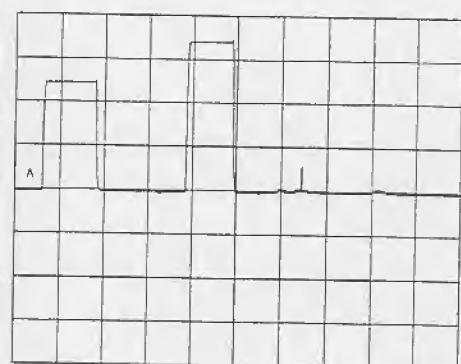


RETURN

TP6:

A=0.5 V

TB= 0.4ms TD= 0D

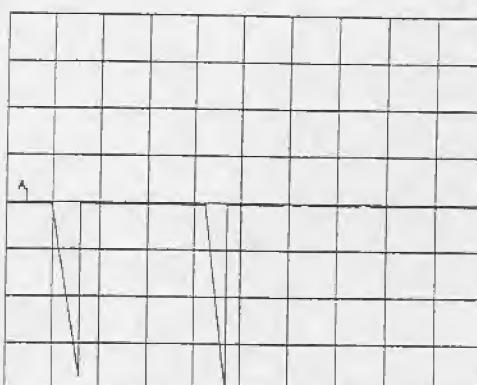


RETURN

TP17:

A= 1 V

TB= 0.4ms TD= 0D

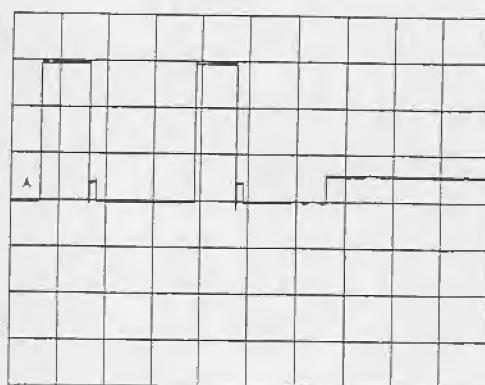


RETURN

TP8:

A= 1 V

TB= 0.4ms TD= 0D

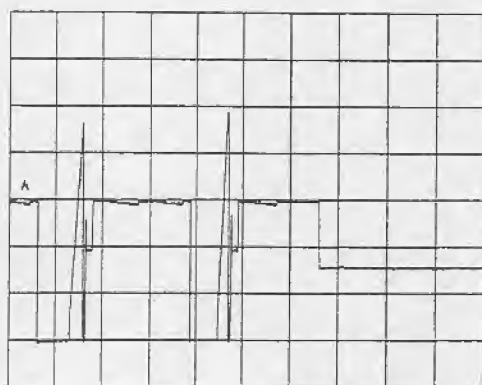


RETURN

TP9:

A= 2 V

TB= 0.4ms TD= 0D



RETURN

Appendix

Parts Lists, Assembly Drawings, and Schematics

72042A1, Final Asm	Appendix-2
72040B1, PWB Asm Main.....	Appendix-4
71054B1, PWB Asm Display	Appendix-7
72042A1, Mon. F/Asm NewOx3 (3303).....	Appendix-8
72042S1, Schematic System NewOx3	Appendix-10
72040B1, PWB Asm Main NewOx3	Appendix-11
72040S1, Schematic Main NewOx3.....	Appendix-13
71054A1, PWB Asm Display w/Speaker.....	Appendix-20
71054B1, PWB Asm Display NewOx2.....	Appendix-21
71054S1, Schematic Diagram Display Board NewOx2	Appendix-22
20613B1, Charger Power Supply 24VDC Output/105-125VAC Input....	Appendix-23
20613B2, Charger Power Supply 24VDC Output/208-252V~ Input	Appendix-25
20613B3, Charger Power Supply 24VDC Output/90-110~ Input	Appendix-28

LINE	LEV	LINE/REF	PART NO/DESC	REV	QUANTITY	UM	MAC
0	0		72042A1 F/ASM NEWOX 3 BCI	5	1.000	EA	M
1	_1	/	20511B1 BARRIER INSULATING BOTTOM	1	1.000	EA	B P
2	_1	/	20511B2 BARRIER INSULATING TOP	1	1.000	EA	B P
3	_1	/	20613B1 CHARGER 8200 3303 105-125V 60HZ	1	1.000	EA	B P
4	_1	0	PACK2 PACKING MATL NEWOX2 3302/3303/8200		1.000	EA	B P
5	_1	1	72041B1 CASE WITH SCREENED WINDOW NEWOX3	2	1.000	EA	B P
6	_1	3	72040B1 PWB A/T MAIN NEWOX3	16	1.000	EA	B P
7	_1	4	71054B1 PWB A/T DISPLAY NEWOX2 /3303	13	1.000	EA	B P
8	_1	7	20605B3 BATTERY PACK NiMH	0	1.000	EA	B P
9	_1	8	12026B3 SCREW TAPPING 4 X 1/4 TYPE B PHILLIPS PAN HD	0	4.000	EA	B P
10	_1	9	70420B2 WASHER RUBBER .693 ID X .830 OD		1.000	EA	B P
11	_1	10	71178B1 SPEAKER LOW-IMPEDANCE NEWOX2	0	1.000	EA	B P
12	_1	13	57217B1 ADHSV NON-CORROSIVE DC738 *SH*	.000		EA	B P
13	_1	14	71087B2 LABEL QUICK USER REFERENCE GUIDE	0	1.000	EA	B P
14	_1	15	71012B5 LABEL INFORMATIVE 3302/3303 BCI	2	1.000	EA	B P
15	_1	16	71011B56 ID LABEL 3303 NEWOX3	0	1.000	EA	B P
16	_1	17	71058B5 LENS KEYPAD NEWOX3 W/LED	5	1.000	EA	B P
17	_1	19	12028B1 SCREW TAPPING #4 X 7/8 TYPE BA PHILLIPS PAN	0	5.000	EA	B P
18	_1	20	70868C8 INSULATOR 3302 DISPLAY BOARD	1	1.000	EA	M P

(A2)

LINE	LEV	LINE/REF	PART NO/DESC	REV	QUANTITY	UM	MAC
19	_1	21	56239B1 TAPE DOUBLE-SIDED FOAM	0 .168 1/2"W X 1/32"T		FT	B P
20	_1	22	20442B6 WIRE STRANDED 26AWG VIOLET	0 .292 300V		FT	B P
21	_1	23	71059B1 LED W/SILKSCREEN SENSOR	4 1.000		EA	B P
22	_1	24	71059B2 LED W/SILKSCREEN BATTERY SYMBOL	4 1.000		EA	B P
23	_1	25	71059B3 LED W/SILKSCREEN BELL	4 1.000		EA	B P
24	_1	26	20606B1 BRKT BATT SUPPORT	2 1.000 8200/3303		EA	B P
25	_1	27	20621B1 LABEL BATT PACK (MADE BY MFG.)	0 1.000 CAPNOCHECK		EA	M P
26	_1	28	58362B1 LABEL CE MARK	1 1.000		EA	B P
27	_1	29	31062B2 LABEL CSA TUV CHARGER	0 1.000 8210 8212		EA	B P

(A-4)

BCI INTERNATIONAL		Dwg No. 72040B1
PWB Assembly Main Newox3		Page 3 of 5
	Rev Date: 9-9-98	Rev. 16

DESCRIPTION	QTY	DESIGNATION(S)	MANUFACTURER'S PART NO.
.22pF,.50V,5%	3	C1,C26,C27	1206 COG SMT, Any
.1uF,.50V,10%	60	C2,C3,C4,C5,C6,C7,C8,C9, C10,C11,C12,C19,C20,C21, C22,C23,C24,C25,C30,C34, C35,C36,C37,C38,C40,C41, C44,C45,C52,C55,C56,C57, C58,C59,C60,C63,C64,C65, C66,C67,C68,C69,C71,C72, C74,C75,C76,C77,C81,C82, C85,C86,C87,C90,C91,C95, C97,C102,C103,C104	1206 X7R SMT, Any
10pF,.50V,10%	3	C13,C53,C54	1206 COG SMT, Any
.1uF,POLY	1	C14	ECQ-V1H104JZ3 Panasonic
1500pF,POLY	1	C15	QYA2A152KTP Nichicon
.39uF,POLY	1	C16	ECQ-V1H394JZ Panasonic
120pF,.50V,5%	2	C18,C17	1206 COG SMT, Any
.001uF,.50V,10%	2	C28,C29	1206 X7R SMT, Any
470uF,6.3V	1	C31	477RSS6R3M Illinois Cap
10uF,TANT,16V	7	C32,C33,C48,C50,C61,C62,O98	6032 TANT SMT, Any
100uF,6.3V	2	C42,C43	1D7RSS6R3M Illinois Cap.
680uF,6.3V	1	C46	ECEA0JFQ681 Panasonic
1uF,TANT,16V	7	C47,C51,C78,C79,O80,C88,C89	3216 SMT, Any
220pF, +/-5%	3	C49,C96,C101	1206 COG SMT, Any
100uF,16V	2	C70,C92	ECEA1CFS101 Panasonic
.01uF,100V,10%	4	C73,C93,C94,C100	1206 X7R SMT, Any
56pF,.50V, +/-5%	2	C83,C84	1206 COG SMT, Any
33uF,.35V	1	C99	ECEA1VU330 Panasonic
BAV99LT1	6	D1,D2,D3,D6,D13,D14	Motorola or any
MURD620CT	2	D5,D7	MURD610CT , MURD615CT or MURD620CT Motorola, D-PAK General Semiconductor
SMBJ36A (Preferred) Or SMBG36A	1	D8	
CMR1-02	2	D9,D10	SMD Central Semiconductor Corp.
DL5242B	2	D11,D12	Diodes, Inc, Liteon or any
BLM21B222S	12	FB1,FB2,FB3,FB4,FB5,FB6, FB9,FB10, FB7,FB8,FB11,FB12	Murata Erie
BLM41A01PT			744-8 T&B Ansley
8 POS SIP SOCKET	1	JP1	AMP 103321-3 or similar
3 POS SIL HEADER	1	JP2	747905-2 AMP
DB9-F	1	J1	AMP 1-103321-2
12 POS SIL HEADER	1	J6	22-23-2031 Molex
3 POS SIL LOCKING HEADER	1	J7	DJ005B LZR
POWERJACK	1	J8	500-1579 B.H. Elec.
FILTER COM MODE 15uH	1	L1	HL-KI210L Hurricane Lab
100uH,2.0A	1	L2	Any, or MMBTA56LT1
MMBTA55LT1	3	Q1,Q2,Q18	Any
MMBT3904LT1	2	Q3,Q4	Any
MMBTA05LT1	3	Q5,Q6,Q19	Any, or MMBTA06LT1
2N7002	1	Q16	Any

A-4

BCI INTERNATIONAL		Dwg No. 72040B1
PWB Assembly Main Newver3		Page 4 of 5
	Rev Date: 9-9-98	Rev. 16

<u>DESCRIPTION</u>	<u>QTY</u>	<u>DESIGNATION(S)</u>	<u>MANUFACTURER'S PART NO.</u>
MTD2955	1	Q17	
732K,.125W,1%,100PPM 100K,1%,.125W,100PPM	6 15	R1,R38,R51,R71,R97,R47 R2,R8,R9,R28,R29,R34,R64, R65,R66,R67,R68,R69,R70, R90,R10	Motorola, D-PAK, or SMD10P05 or SMD10P06 Siliconix, or IRFR9020, or IRFR9022, or IRFR9024 or IRFR9025 International Rectifier, or IRFR9024, or IRFR9020 Diodes Inc.
20K,1%,.125W,100PPM 56.2K,1%,.125W,100PPM 10K,1%,.125W,100PPM	5 3 8	R3,R4,R11,R88,R89 R7,R5,R98 R6,R14,R15,R18,R19,R49, R86,R96	1206 SMT, Any
47,.125W,5%,200PPM 45.3K,1%,.125W,100PPM	3 8	R12,R13,R74 R17,R16, R45,R48,R52,R53,R54,R73	1206 SMT, Any
2.49K,1%,.125W,100PPM	10	R20,R21,R26,R56,R57,R58, R59,R60,R62,R63	1206 SMT, Any
5.1,.125W,5%,200PPM 270,.125W,5%,200PPM 560,.125W,5%,200PPM	1 2 2	R22 R24,R61 R25,R75	1206 SMT, Any
10,.125W,5%,200PPM 100,.125W,5%,200PPM	1 2	R27 R72,R91	1206 SMT, Any
53.6K,1%,.125W,100PPM 19.6K,1%,.125W,100PPM 3.65K,1%,.125W,100PPM	2 1 12	R76,R77 R78 R79,R80,R81,R82,R83,R84, R85,R94,R95,R23,R30,R31	1206 SMT, Any
1.6,.125W,5%,200PPM 1K,1%,.125W,100PPM	2 1	R87,R93 R92	1206 SMT, Any
TESTPOINT	14	TP6,TP7,TP8,TP9,TP11, TP14,TP15,TP16,TP17,TP18, TP19,TP20,TP21,TP24	TP-105-01-02 Components Corp.
100uH,2.0A with auxilary winding	1	T1	BCI 72046B1
10K @ 25C,-4.41%/C TLC272CD	2 4	T2,T3 U1,U2,U3,U8	KC003T Keystone
AD711JR or MC34081BD	2	U9,U4	Texas Instruments Analog Devices Motorola
DG308ACY	1	U5	Siliconix, Harris or Maxim
MC14051BD	1	U6	Motorola
MAX643BCWE	1	U7 or U7X	Maxim or DAC8043FS Analog Devices, or 72032B1 BCI

A-3

BCI INTERNATIONAL		Dwg No. 72040B1
PWB Assembly Main Newox3		Page 5 of 5
	Rev Date: 9-9-98	Rev. 16

DESCRIPTION	QTY	DESIGNATION(S)	MANUFACTURER'S PART NO.
MC74HC132AD	1	U13	Motorola or any
HD64180RF6X	1	U14	Hitachi
MC74HC14AD	1	U15	Motorola or any
MC74HC259D	1	U16	Motorola or any
MC74HC139AD	1	U17	Motorola or any
27C256-20/L	1	U18	Microchip
SOCKET 821973-1 (or Equiv.)	1	AMP	
HM62256LFP-15T (or Faster)	1	U19	Hitachi
AD7870JP	1	U21	Analog Device
MC74HC540DW	1	U22	Motorola or any
MAX706CSA <u>or</u>	1	U25	Maxim
ADM706AR			Analog Devices
LT1180ACS	1	U26	Linear Technology
MAX713CSE	1	U27	Maxim
ICL7556ISD	1	U28	Maxim
MAX738CWE	1	U29	Maxim
LT1121CST-5	1	U30	Linear Technology
CRYSTAL 12.288MHZ	1	X11	EPSON CA-301 12.288M-C
FAB ARTWORK	1	400	BCI 72039B1
STANDOFF	5	401	Unicorp SU269-4A-16
COVER SHIELD	1	402 (SEE NOTE 3)	BCI 71017B1
SOFTWARE ASM	1	403 (SEE NOTE 4)	BCI 71073A1
BARRIER INS. 2 MIL	*1	404	BCI 20511B1
BARRIER INS. 11MIL	*1	405	BCI 20511B2
GLUE, HOT MELT	A/R	406	BCI 58326B1
SILICONE	A/R	407	Any
SEALANT (BIWAX 84123)	A/R	408	BCI 31098B1 or
EPIC PREG 0127			BCI 31098B2

* - INDICATES SUPPLIED BY BCI

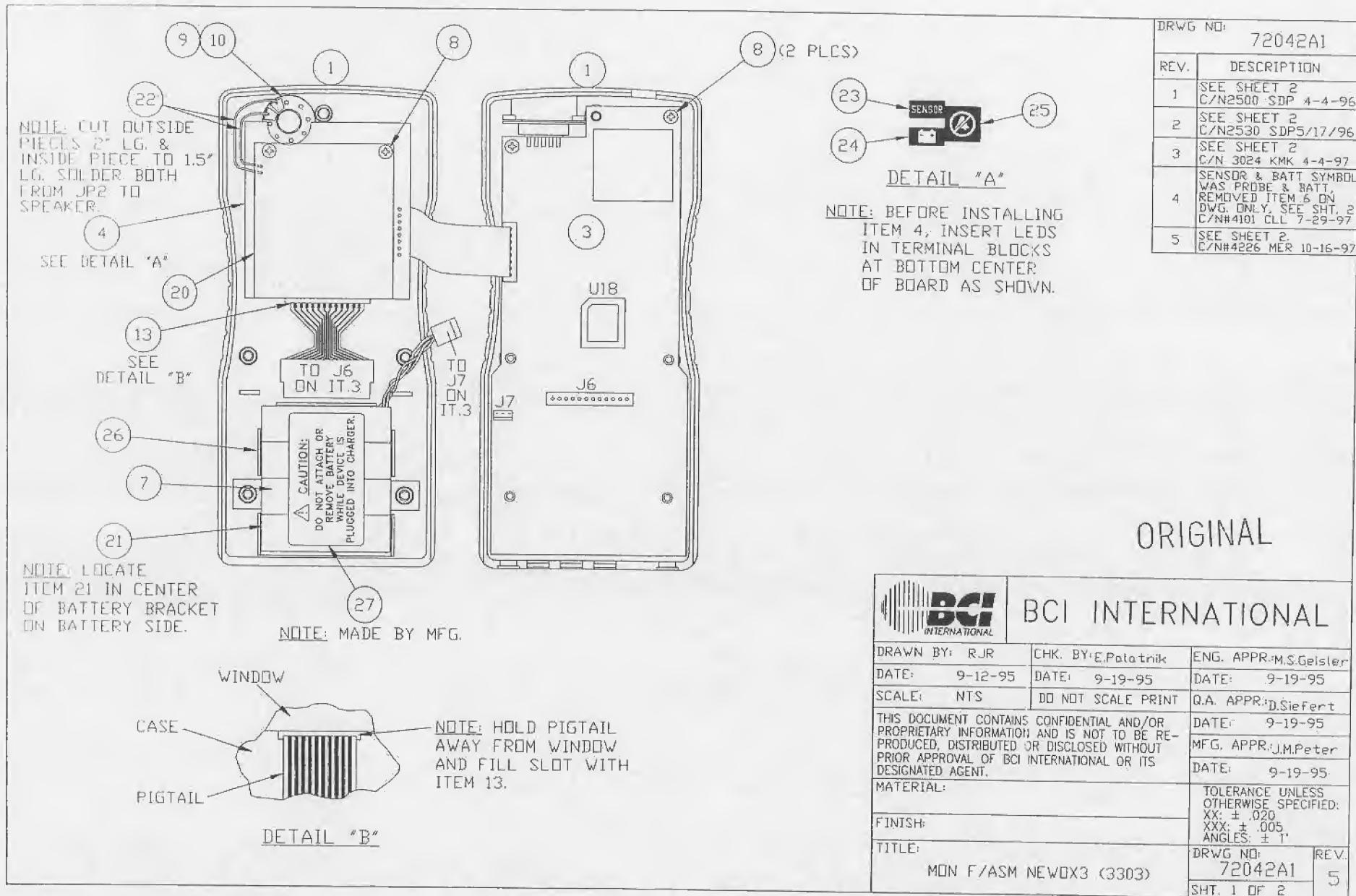
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BCI INTERNATIONAL				Dwg No. 71054B1
PWB ASM DISPLAY NEWOX2				Page 2 of 2
		Rev Date: 3-10-99		Rev 14

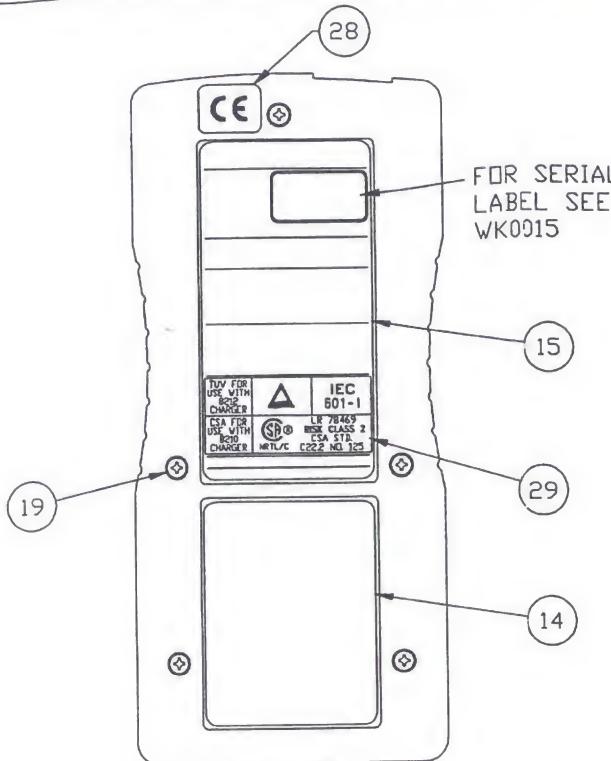
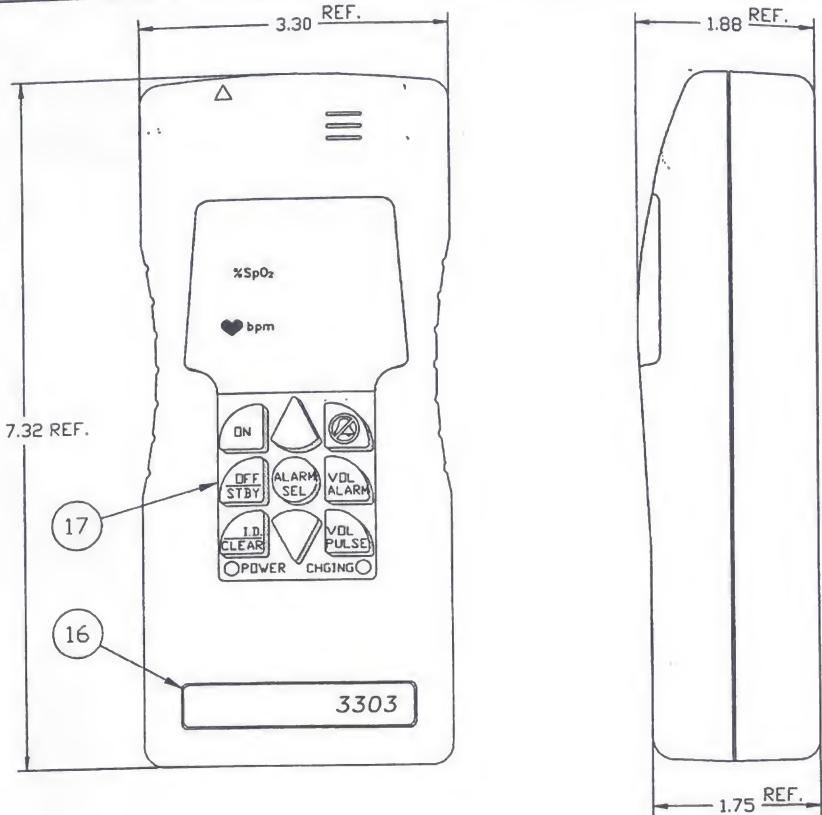
Qty	Ref.	Part	Manuf. P.N.	Vendor
2	C1,C5	.1uF,50v,+80,-20%,Z5U	Cer, Axial, Any	Any
1	C3	1000uF,6.3V,Low Imp.	ECAOJFPQ102 PANASONIC	Any
1	C4	470pF,63VDC,COG, +/-5%	Any	Any
1	C6	10uF,6.3V,TANT	Any	Any
1	C7	.01uF,50v,+80,-20%,Z5U	Cer, Axial,Any	Any
3	DS1,DS2,DS3	HDSP-E103	HEWLETT PACKARD	Any
3	DS4,DS5,DS6	HDSP-A103	HEWLETT PACKARD	Any
1	DS7	HLCP-J100	HEWLETT PACKARD	Any
3	DS8,DS9, DS10	.100 8 POS SOCKET	T & B ANSLEY 744-8	Any
6	D4,D5,D6, D8,D9,D10	1N4148	Any	Any
1	JP1	HEADER 8X.100	8POS FLEXIBLE FLAT CABLE FSP22.5A-8 THOMAS & BETTS	
1	Q1	S19953DY	SILICONIX	Any
1	R1	27K,1/4W,5%,CF	Any	Any
1	R2	20K,1/4W,5%,CF	Any	Any
1	R3	100K,1/4W,1%,MF	Any	Any
1	R4	30.1K,1/4W,1%,MF	Any	Any
1	R5	5.62K,1/4W,1%,MF	Any	Any
1	R6	10 Chm,1/4W,5%	Any	Any
1	U1	MAX7219CNG	MAXIM	Any
1	U2	MC74HC132AN	MOTOROLA	Any
1	400	FAB BOARD	71053B1(REV.D FILMS/REV.2 DWG)	

ORIGINAL

As7



DRWG NO:	72042A1
REV.	DESCRIPTION
1	ADDED ITEM 28. C/N2500 SDP 4-4-96
2	ADDED ITEM 29. C/N2530 SDP5/17/96
3	ADDED ITEMS 30-32 C/N 3024 KMK 4-4-97
4	PICTORIALLY CHANGED ITEM 1, SEE SHEET 1 C/N#4101 CLL 7-29-97
5	ITEM 29 WAS ITEMS 29, 30, 31, & 32. C/N#4226 MER 10-16-97

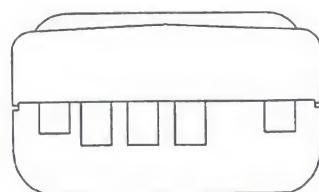


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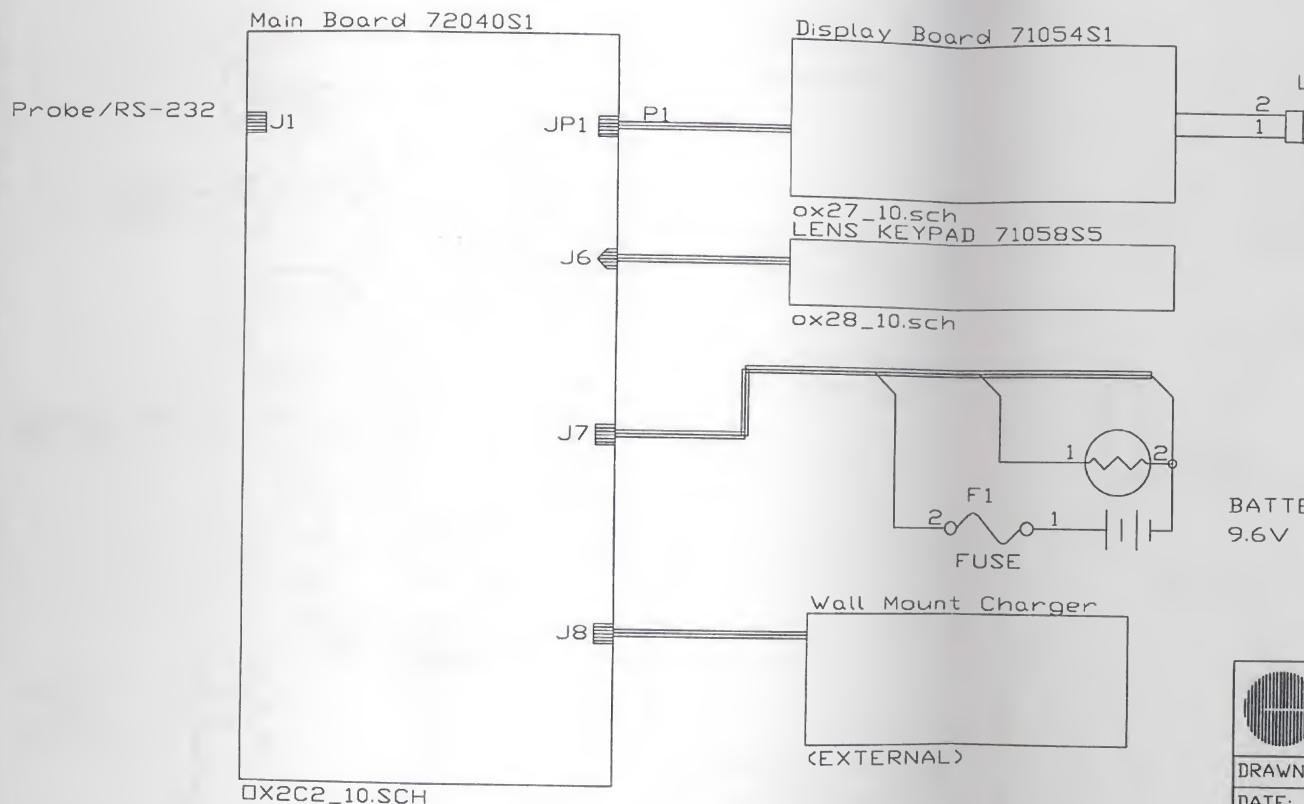


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DRAWN BY: RJR	CHK. BY: E.Palatnik	ENG. APPR.: M.S.Geisler
DATE: 9-12-95	DATE: 9-19-95	DATE: 9-19-95
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MATERIAL:		TOLERANCE UNLESS OTHERWISE SPECIFIED: XX: ± .020 XXX: ± .005 ANGLES: ± 1°
FINISH:		
TITLE: MON F/ASM NEWOX3 (3303)		DRWG NO: 72042A1 REV. 5 SHT. 2 OF 2



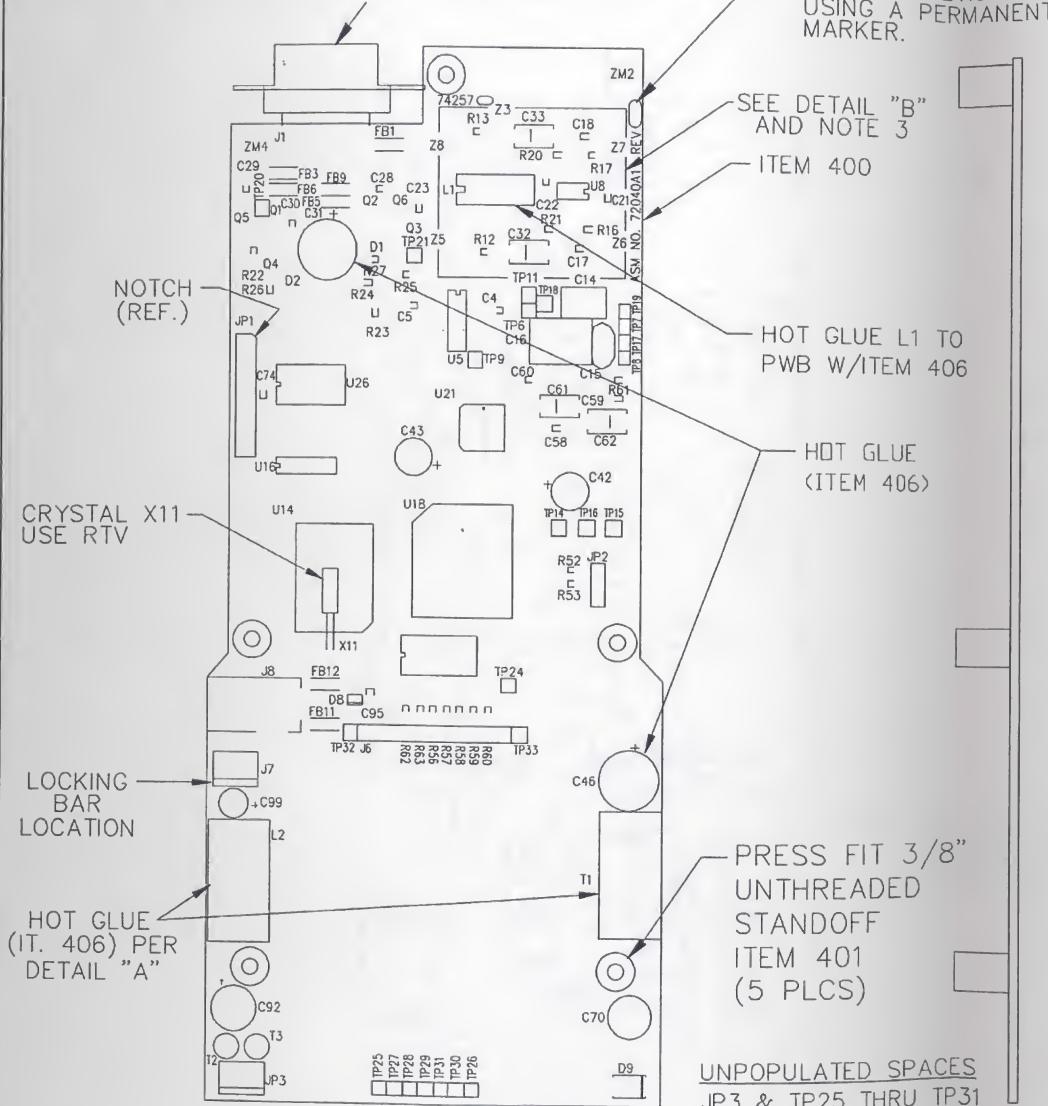
DRWG NO:	72042S1
REV.	DESCRIPTION



BCI INTERNATIONAL

DRAWN BY: RJR	CHK. BY: E. Palatak	ENG. APPR.: J.M. Lata
DATE: 1-6-96	DATE: 1-8-96	DATE: 1-8-96
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MATERIAL:		
FINISH:		
TITLE: SCHEMATIC SYSTEM NEWOX3		
DRWG NO: 72042S1	REV. 0	SHT. 1 OF 1

PLACE "J1" OVER EDGE OF BOARD AND SOLDER PINS FULL LENGTH OF TOP & BOTTOM PADS.

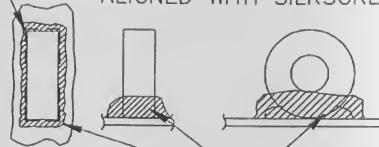


TOP VIEW OF BOARD

NOTES:

- 1) MANUFACTURER TO PLACE A "MFD. BY" IDENTIFICATION MARK ON BOARD.
- 2) IF MANUFACTURER TESTS BOARDS A TEST STAMP MUST BE PLACED ON THE BOARD INDICATING IT PASSED ALL TESTS.
- 3) COVER SHIELD ITEM 403 IS TO BE ASSEMBLED PER DETAIL "B" ON SHT2 AND MOUNTED BY VENDOR.
- 4) VENDOR IS TO BUY, PROGRAM AND INSTALL E-PROM PER SOFTWARE ASSEMBLY ITEM 403.
- 5) USE HOT MELT GLUE (ITEM 406) TO AFFIX C31,C46,L2 AND T1 TO MAIN BOARD.

NOTE: INDUCTOR MUST BE PROPERLY ALIGNED WITH SILKSCREEN ON PWB.



DETAIL "A"

SHEETS 3-5 "V" SIZE (BOM)



BCI INTERNATIONAL

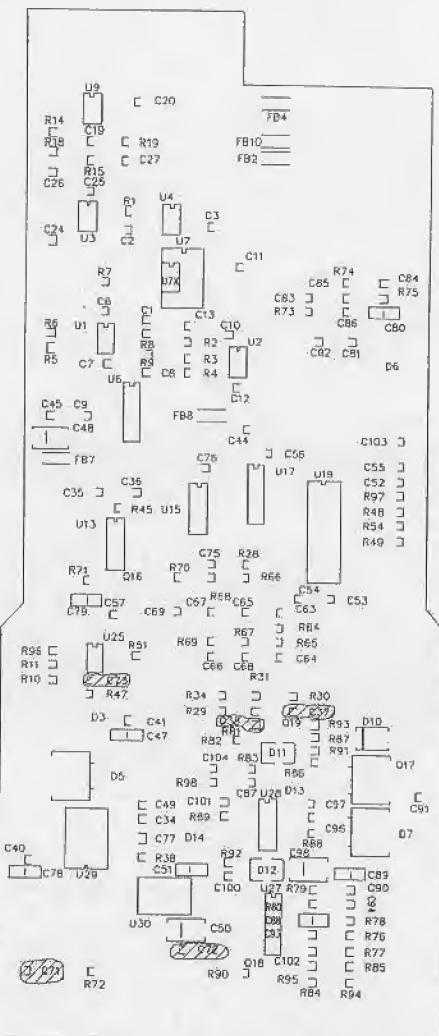
DRAWN BY: RJR	CHK. BY: E.Palatnik	ENG. APPR.: M.S.Geisler
DATE: 9-18-95	DATE: 9-19-95	DATE: 9-19-95
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MATERIAL:		
FINISH:		
TITLE: PWB ASM MAIN NEW0X3		
DRWG NO: 72040B1		REV. 16
SHT. 1 OF 5		

ORIGINAL

[Page 10 of 13]

Pāṇḍita

REV	DESCRIPTION
1	SEE SHEET 1 KIR 9-18-95
2	SEE SHEET 1 KMF 11-27-95
3	SEE SHEET 1 JPR 1-17-96
4	SEE SHEET 1 KMF 2-2-96
5	SEE SHEET 1 KMK 3-7-96
6	SEE SHEET 1 SDP 3-21-96
7	SEE SHEET 1 SDP 5/2/96
8	SEE SHEET 1 SDP 5/3/96
9	CLARIFIED POLARITY OF DIO ALSO SEE SHEET 1, EAR# 2126 SDP 7/12/96
10	SEE SHEET 1 C/N 2762 NLL 10/21/96
11	ADDED NOTE, SEE SHEETS 1 & 5 C/N 2830 CLL 1-2-97
12	SEE SHEET 1. C/NH 2980 SDP 2-27-97
14	SEE SHEET 1. EAR# 2801 MER 5-16-97
15	SEE SHEET 3. C/N 4391 MER 4-15-98
16	SEE SHEET 1. C/N 4549 MAM 9-9-98



BOTTOM VIEW OF BOARD

NOTE: SEAL C37, C38,
C71, C72 & C73
USING ITEM 408



BCI INTERNATIONAL

DRAWN BY: RIR CHK BY: E.Bolat-ii FILE NUMBER:

DATE: 9-18-95 DATE: 9-18-95 PAGE: 1

SCALE NTS DO NOT SCALE DRAFTS OR MACHINES

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DESIGNATED AGENT. MATERIAL

MATERIALS AND METHODS

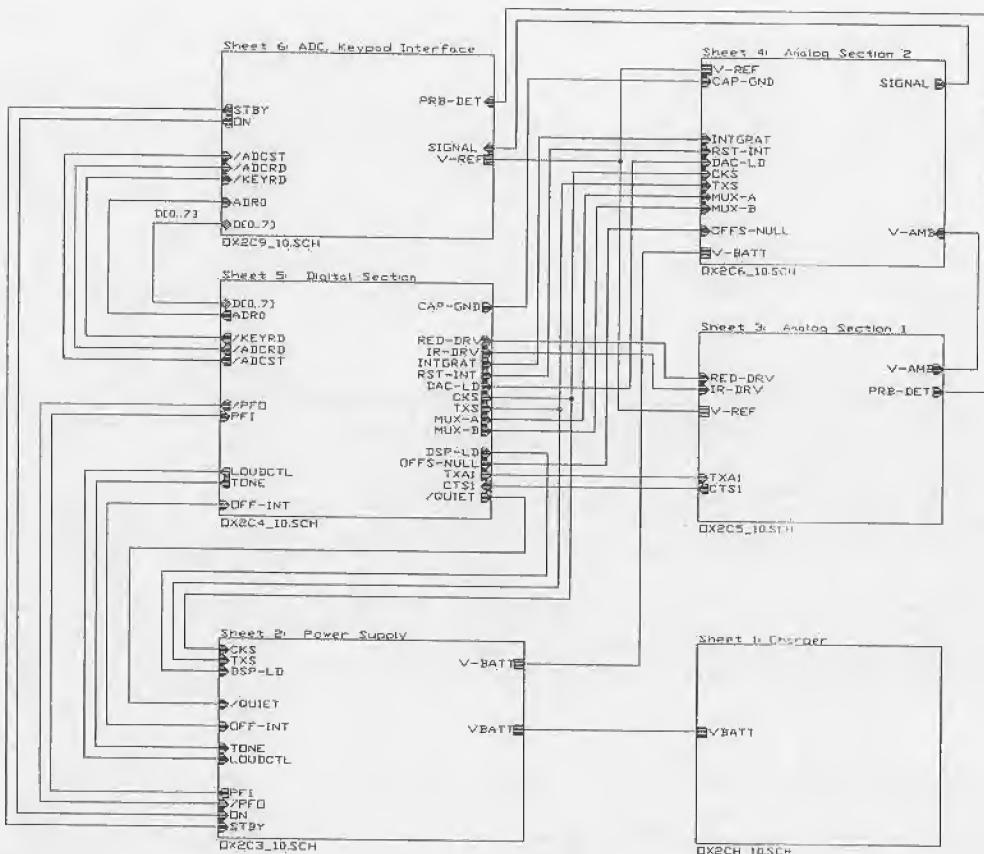
FINISH

TITLE: _____ **DATE:** _____

PWB ASM MAIN PAGE | [HOME](#)

www.hsm.mil/awards

DRWG NO:	72040S1
REV.:	DESCRIPTION
1	SEE SHEET 4, 2-2-96



ORIGINAL

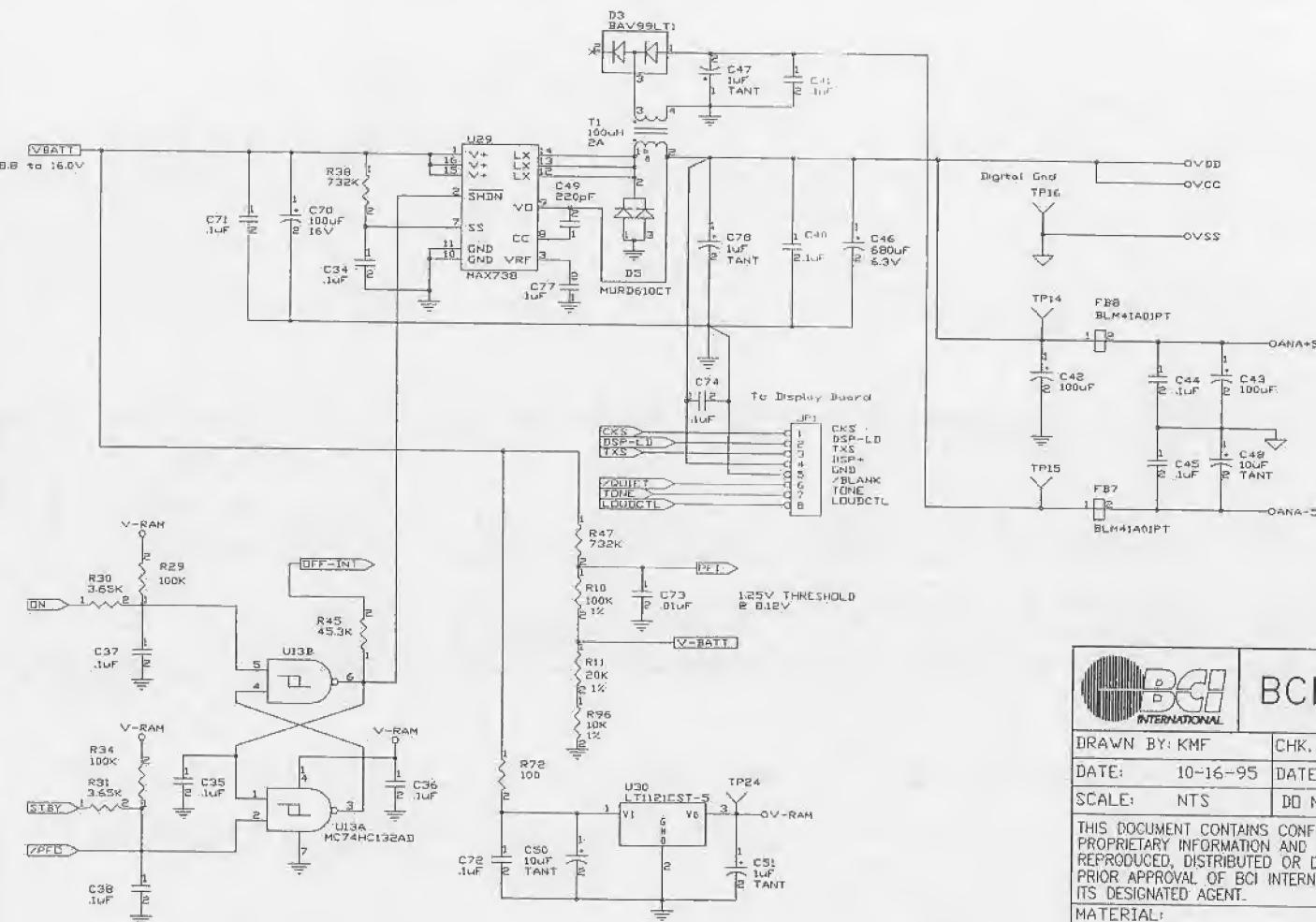


BCI INTERNATIONAL

DRAWN BY: KMF	CHK. BY: E.Patalnik	ENG. APPR.: M.S.Geisler
DATE: 10-16-95	DATE: 10-16-95	DATE: 10-16-95
SCALE: NTS	DO NOT SCALE PRINT	Q.A. APPR.: D.Siefert
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DATE: 10-17-95		
MFG. APPR.: J.M.Peter		
DATE: 10-17-95		
MATERIAL:		
TOLERANCE UNLESS OTHERWISE SPECIFIED: XX: ±.020 XXX: ±.005 ANGLES: ±1°		
FINISH:		
TITLE: SCHEMATIC MAIN NEWOX3		
DRWG NO: 72040S1		REV. 1
SHT. 1 OF 7		

POWER SUPPLY SECTION

DRAWN NO:	
REV.	DESCRIPTION
1	SEE SHEET 4. 2-2-96



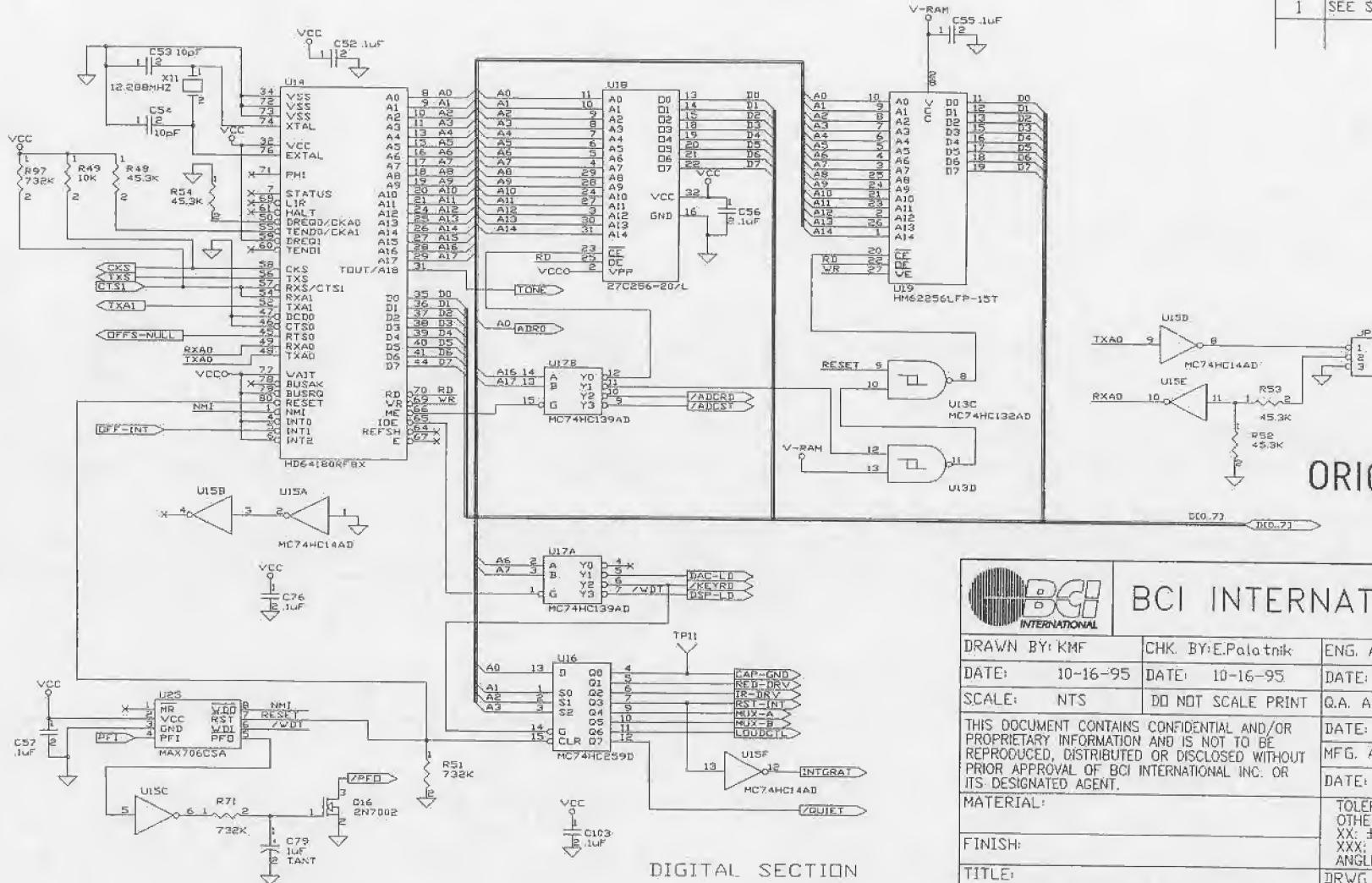
ORIGINAL



BCI INTERNATIONAL

DRAWN BY: KMF	CHK. BY: E.Palatik	ENG. APPR.: M.S.Geister
DATE: 10-16-95	DATE: 10-16-95	DATE: 10-17-95
SCALE: NTS	DO NOT SCALE PRINT	Q.A. APPR.: D.Siefert
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MATERIAL:		
TOLERANCE UNLESS OTHERWISE SPECIFIED: XX: ± 0.020 XXX: ± 0.005 ANGLES: $\pm 1^\circ$		
FINISH:		
TITLE: SCHEMATIC MAIN NEWDX3		DRWG NO: 72040S1
		REV. 1
SHT. 2 OF 7		

DRWG NO: 72040S1
REV. DESCRIPTION
1 SEE SHEET 4. 2-2-96



DIGITAL SECTION

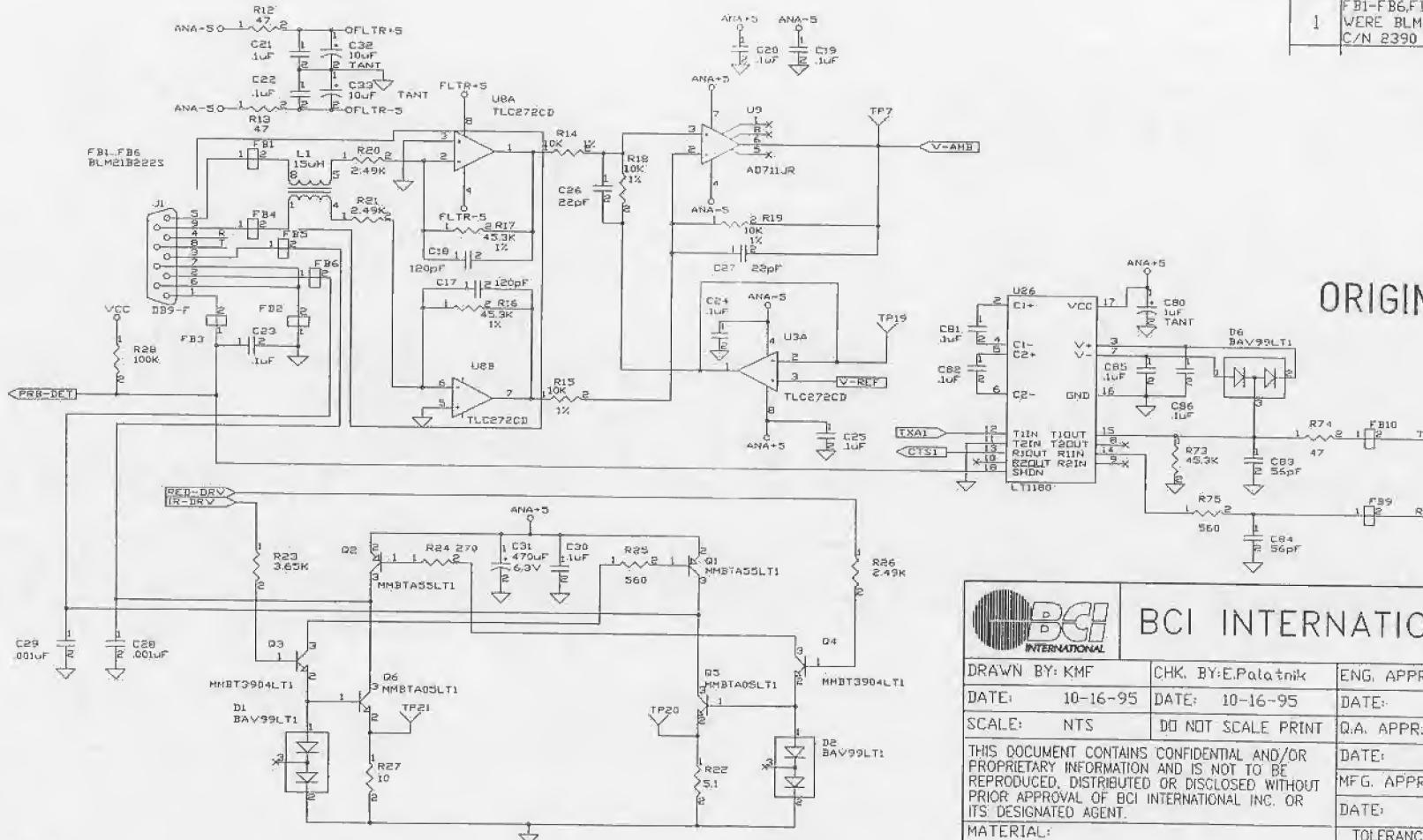


BCI INTERNATIONAL

DRAWN BY: KMF	CHK. BY: E.Polaertnik	ENG. APPR: M.S.Geister
DATE: 10-16-95	DATE: 10-16-95	DATE: 10-17-95
SCALE: NTS	DO NOT SCALE PRINT	Q.A. APPR: D.Siefert
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MATERIAL:		TOLERANCE UNLESS OTHERWISE SPECIFIED: XX: ± 020 XXX: ± .005 ANGLES: ± 1°
FINISH:		
TITLE: SCHEMATIC MAIN NEWOX3		DRWG NO: 72040S1 REV. SHT. 3 DE 7 1

DRWG NO:	
72040S1	
REV.	DESCRIPTION
1	F B1-FB6,FB9 & FB10 WERE BLM41A01PT, C/N 2390 KMF 2-2-96

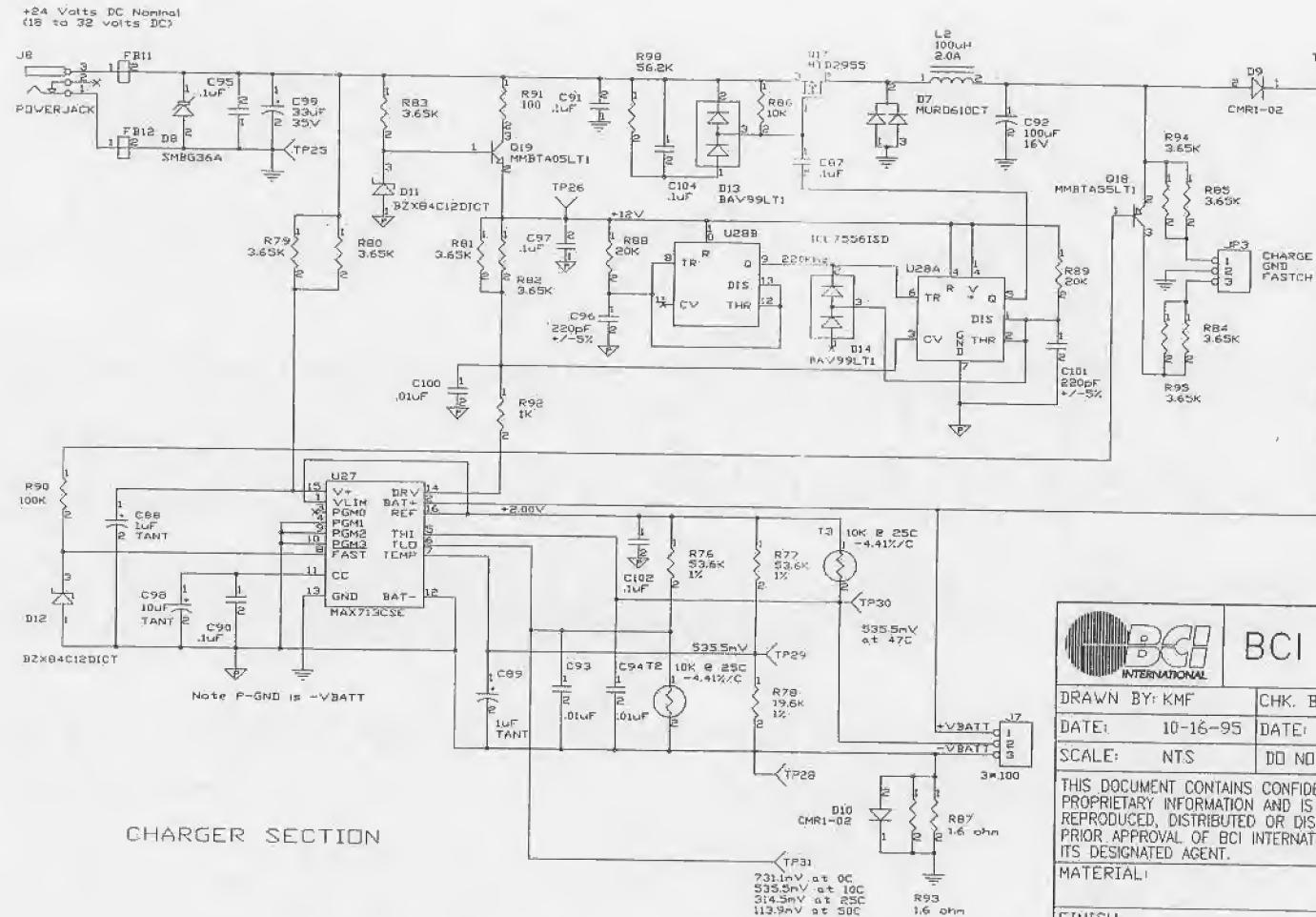
ORIGINAL



BCI INTERNATIONAL

DRAWN BY: KMF	CHK. BY: E.Palatnik	ENG. APPR: M.S.Gelster
DATE: 10-16-95	DATE: 10-16-95	DATE: 10-17-95
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MATERIAL:		
FINISH:		
TITLE: SCHEMATIC MAIN NEW0X3		
DRWG NO: 72040S1		REV: 1
SHT. 4 OF 7		

DRWG NO:	72040S1
REV.	DESCRIPTION
1	SEE SHEET 4, 2-2-96



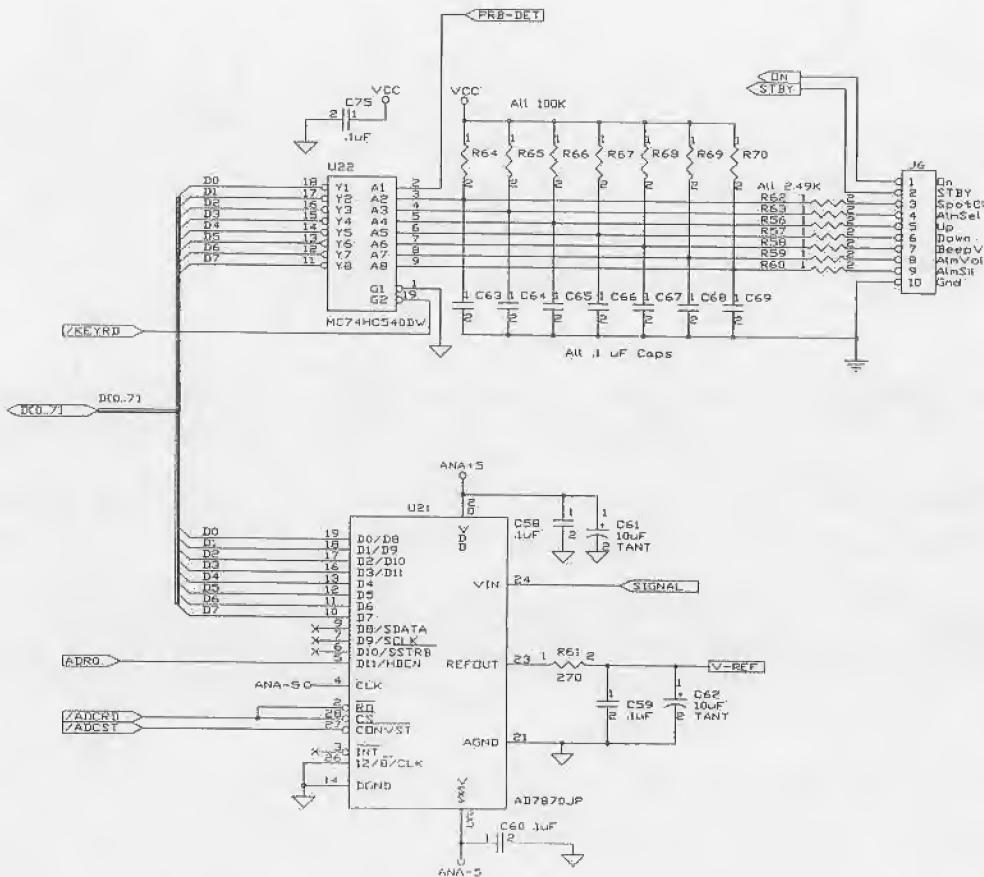
CHARGER SECTION



BCI INTERNATIONAL

DRAWN BY: KMF	CHK. BY: E.Palatnik	ENG. APPR.: M.S.Geisler
DATE: 10-16-95	DATE: 10-16-95	DATE: 10-17-95
SCALE: NTS	DO NOT SCALE PRINT	Q.A. APPR.: D.SieFert
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MATERIAL:		TOLERANCE UNLESS OTHERWISE SPECIFIED: XX: ±.020 XXX: ± .005 ANGLES: ± 1°
FINISH:		
TITLE: SCHEMATIC MAIN NEW0X3		DRWG NO: 72040S1
		REV. 1
SHT. 5 OF 7		

DRWG NO:	72040S1
REV.	DESCRIPTION
1	SEE SHEET 4. 2-2-96



ADC Keypad Interface

ORIGINAL



BCI INTERNATIONAL

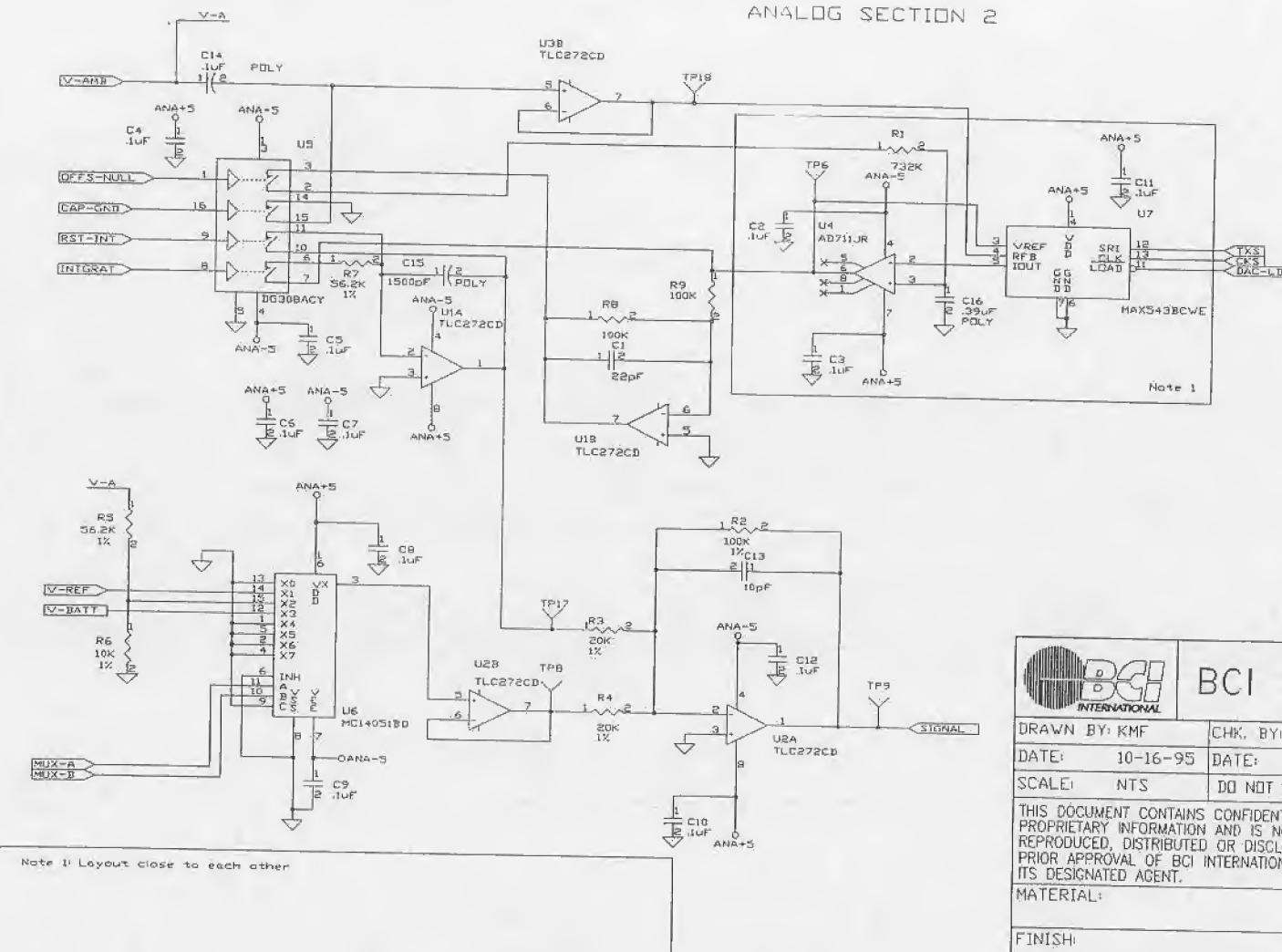
DRAWN BY: KMF	CHK. BY: E.Potatnik	ENG. APPR.: M.S.Geister
DATE: 10-16-95	DATE: 10-16-95	DATE: 10-17-95
SCALE: NTS	DO NOT SCALE PRINT	Q.A. APPR.: D.Sieferl
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MATERIAL:		
FINISH:		
TITLE: SCHEMATIC MAIN NEW0X3		
TOLERANCE UNLESS OTHERWISE SPECIFIED X = ±10% A = ±10% ANGLE = ±1° DIA = .001		

72040S1

1

DRWG NO.	72040S1
REV.	DESCRIPTION
1	SEE SHEET 4. 2-2-96

ANALOG SECTION 2

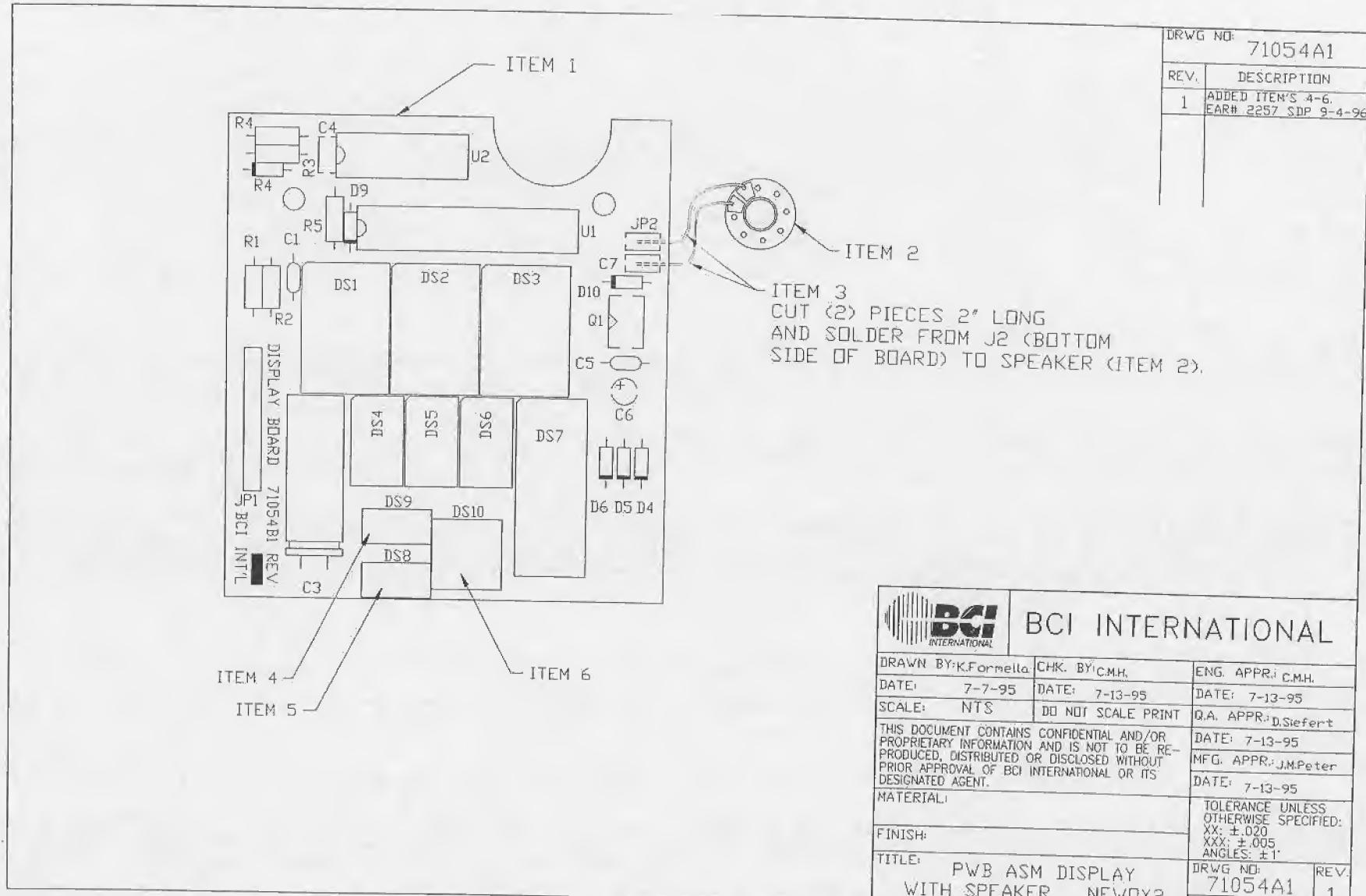


ORIGINAL



BCI INTERNATIONAL

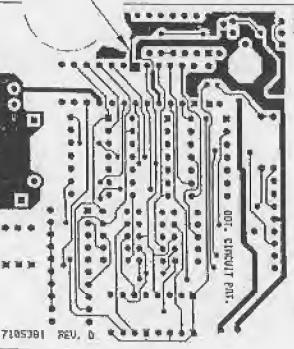
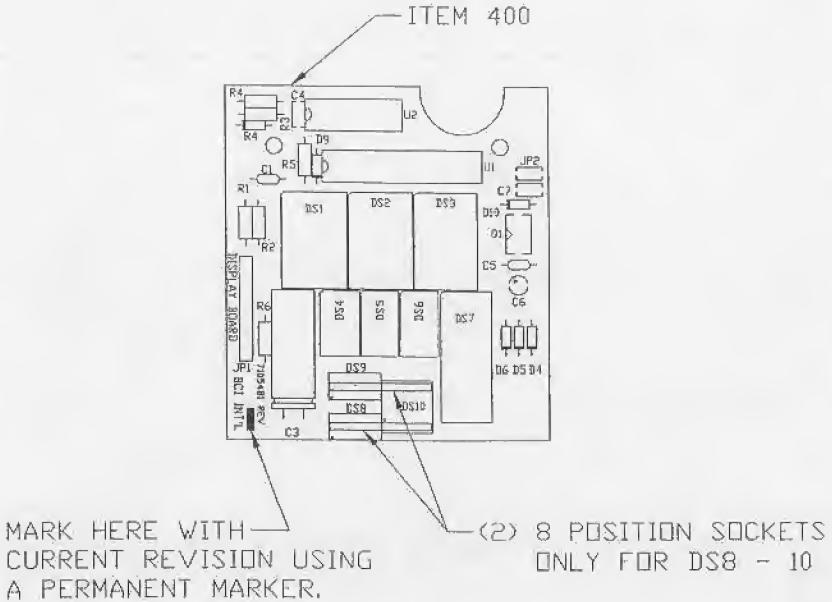
DRAWN BY:	KMF	CHK. BY:	E.Palatnik	ENG. APPR.:	M.S.Geisler
DATE:	10-16-95	DATE:	10-16-95	DATE:	10-17-95
SCALE:	NTS	DO NOT SCALE PRINT		Q.A. APPR.:	D.Siefert
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DATE: 10-17-95					
MFG. APPR.: J.M.Peter					
DATE: 10-17-95					
TOLERANCE UNLESS OTHERWISE SPECIFIED: XX: $\pm .020$ XXX: $\pm .005$ ANGLES: $\pm 1^\circ$					
TITLE: SCHEMATIC MAIN NEW0X3					
DRWG NO.: 72040S1					
REV. 1					
SHT. 7 OF 7					



	BCI INTERNATIONAL	
DRAWN BY: K.Formella	CHK. BY: C.M.H.	ENG. APPR: C.M.H.
DATE: 7-7-95	DATE: 7-13-95	DATE: 7-13-95
SCALE: NTS	DO NOT SCALE PRINT	Q.A. APPR: D.Siefert
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MATERIAL:		
TOLERANCE UNLESS OTHERWISE SPECIFIED: XX: ± .020 XXX: ± .005 ANGLES: ± 1°		
FINISH:		TITLE: PWB ASM DISPLAY WITH SPEAKER NEW0XP
DRWG NO: 71054A1		REV: 1
SHT. 1 OF 1		

ORIGINAL

DRWG NO:	71054B1
REV.	DESCRIPTION
B	REDESIGNED TO REDUCE MONITOR SIZE. RJR 1-29-93
0	CHANGED R4 & R5 FROM 10 OHMS TO 36 OHMS, C/N1679. RJR 7-06-93
1	ADDED JUMPER WIRE PER C/N1690. RJR 7-28-93
2	REMOVED DSB, 9 & 10 FROM BOM. C/N1709. RJR 9-3-93
3	ADDED TRIM LEADS NOTE 2, C/N1789. RJR 2-10-94
4	REVISED TO REFLECT NEW LAYOUT. C/N1789. RJR 2-10-94
5	ADDED NOTE 3. C/N1878. RJR 7-20-94
6	ADDED NOTE 4. C/N1919. BE 9/22/94
7	R4 WAS 10K, R5 WAS 5.62K. GEAR #7843. DRH 2-3-95
8	REMOVED DS8-DS10. EAR # 2257. SDP 9-3-96
9	ADDED NOTE 5. C/N 2981 MER 3-21-97
10	CHANGED NOTE 2. C/03 WAS .029 C/N 3085 MER 5-14-97
11	CHANGED NOTE 5. (C4 & C7 HEIGHT SPECIFIED.) C/N 4138 MER 8-18-97
12	CHANGED R4 TO 30.1K & R5 TO 5.62K. SHT.2 C/N4359. MAR 4/2/98
13	UPDATED ARTWORK. ADDED NOTES 6 & 7 AND BOTTOM CIRCUIT VIEW. C/N4424. MER 10/22/99
14	CHANGE NOTE REGARDING NOTES 7 AND TRACE TO ELIMINATE FLICKER. C/N4767 TAW 3/10/99



BOTTOM CIRCUIT VIEW

NOTE:

1. MANUFACTURER TO PLACE A "MFD. BY" IDENTIFICATION MARK ON BOARD.
2. LEADS MUST BE TRIMMED TO WITHIN .03 OF THE BACK OF THE FINISHED BOARD.
3. IF MANUFACTURER TESTS BOARDS, A TEST STAMP MUST BE PLACED ON BOARD INDICATING IT PASSED ALL TESTS.
4. HOT MELT GLUE, ITEM 401, TO BE USED TO SECURE C3 TO DISPLAY BOARD.
5. IMPORTANT: ALL COMPONENTS MUST BE MOUNTED AS CLOSE TO THE BOARD AS POSSIBLE.
(C4 & C7 MUST BE MOUNTED FLUSH OR LOWER THAN U2)
6. IF DISPLAY LEDs EXHIBIT ANY "FLICKERING" WHEN INSTALLED IN A FINISHED PULSE OXIMETER UNIT AT BCI, THE TRACE INDICATED IN BOTTOM CIRCUIT VIEW CAN BE CUT TO ELIMINATE THE FLICKER.
7. HOLES OF JP2 TO BE MASKED (NOT FILLED WITH SOLDER).

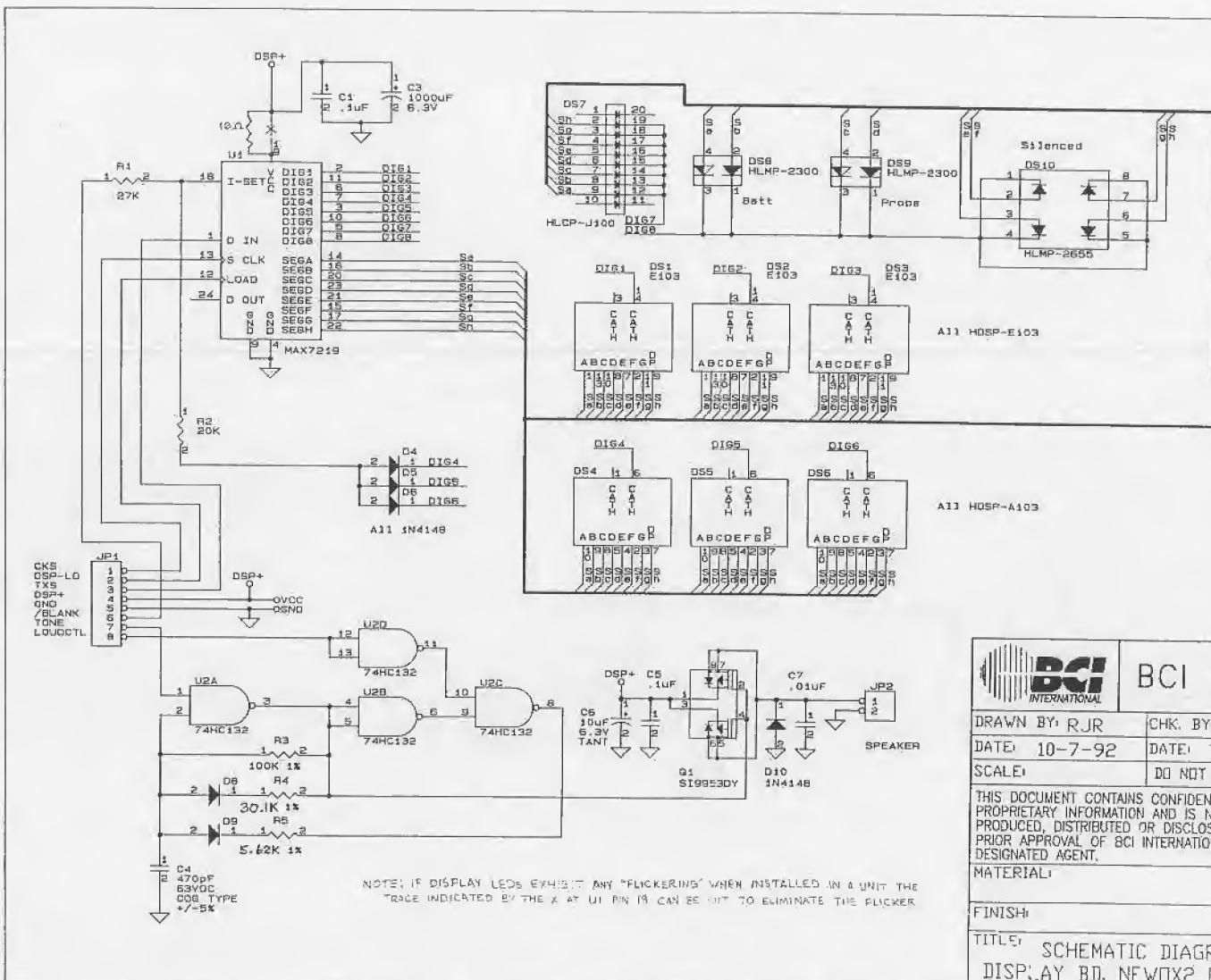
SHEET 2 IS "V" SIZE (BOM)



BCI INTERNATIONAL

DRAWN BY: RJR	CHK. BY: D.Hegerty	ENG. APPR: E.Palatnik
DATE: 10-15-92	DATE: 7-9-93	DATE: 7-9-93
SCALE: ~	DO NOT SCALE PRINT	Q.A. APPR: P.Boese
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MATERIAL:		
FINISH:		
TITLE: PWB ASM DISPLAY NEWOX2		DRWG NO: 71054B1
		REV. 14
SHT. 1 OF 2		

ORIGINAL



REV.	DESCRIPTION
B	PINOUT WAS CHANGED ON DSL 2 & 3. R.R. 11-23-92
0	CHANGED R4 & R5 FROM 10 OHMS TO 36 OHMS. C/N#16793 R.R. 7-06-93
1	ADDED C5, D6, C7, D9 & Q1. C4 WAS 1UF, R3 WAS 27K, R4 WAS 36, R5 WAS 36, U2 WAS MC14HC04N. C/N#1902 R.R. 3-4-94
2	R4 WAS 13K, R5 WAS 6.49K (EAR #784) DEH 2-3-95
3	ADDED 10Ω RESISTOR. C/N#2421 MFR. 91-3-94



BCI INTERNATIONAL

DRAWN BY: RJR	CHK BY: D.Hegerty	ENG APPR: E.Palo/tnlk
DATE: 10-7-92	DATE: 7-9-93	DATE: 7-9-93
SCALE: DO NOT SCALE PRINT		QA APPR: P.Boese
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MATERIAL:		TOLERANCE UNLESS OTHERWISE SPECIFIED: XX: ±.020 XXX: ±.005 ANGLES: ±1°
FINISH:		
TITLE: SCHEMATIC DIAGRAM DISPLAY BD, NEWOX2 OXIMETER		DRWG NO: 71054S1 REV: 3 SHT. 1 OF 1



BCI INTERNATIONAL

DRAWING
NO.

20613B1

TITLE	CHARGER/POWER SUPPLY ISOLATED 24VDC OUTPUT/105-125VAC INPUT	DWG. CODE	SHEET 1 OF 2
		B	REV. NO. 1

Revisions

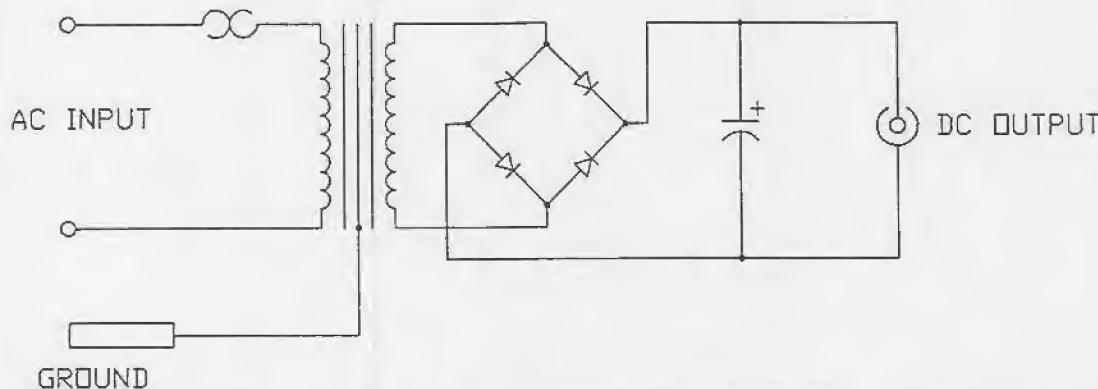
I. SPECIFICATIONS:

- A. Input Voltage 105 - 125 VAC
w/U.S. Standard
Ground Pin
- B. Frequency 60 Hz
- C. Output Voltage 24VDC @ 120VAC Input
- D. Output Current 500mA
- E. Isolation Requirements
Primary to ground pin 1500V RMS
Primary to Secondary 2500V RMS
Secondary to ground pin 2500V RMS
- F. Output Cord 20AWG, 6 ft. Lg. with
5.5mm X 2.5mm Plug
Per UL-544 and
CSA C22.2 NO. 125
- G. Construction See Sheet 2
- H. Charger Markings 50° C
- I. Max. Temperature Rise 130° C, UL Rec. Component
in series with primary.
Elcut #U-23 or equiv.
- J. Thermal Cutout
- K. Windings
Primary 850 turns of 29 AWG
Secondary 180 turns of 24 AWG
- L. Rectifier Full Wave Bridge
- M. Filter Capacitor 1000 uF 35V
- N. Fair-Rite core #2643023002 to be shrink-wrapped in place on
end of output cordset per dwg.

II. HIPOT TESTING

To be performed on each unit by the manufacturer.

- A. 4800 VAC primary to secondary, 1 sec.
- B. 1500 VAC primary to top core, 1 sec.
- C. 800 VAC secondary to top core, 1 sec.



1 6-11-97 SEE SHEET 2 C/N 4024

DRAWN BY DAU	APPROVALS M.S. GEISLER		DWG. NO. 20613B1
ISSUED 1-4-94	J.M. PETER 5-26-95	D. SEIFERT	SHEET 1 OF 2

ORIGINAL



BCI INTERNATIONAL

DRAWING
NO.

20613B1

TITLE

CHARGER/POWER SUPPLY ISOLATED
24VDC OUTPUT/105-125VAC INPUTDWG.
CODE

SHEET

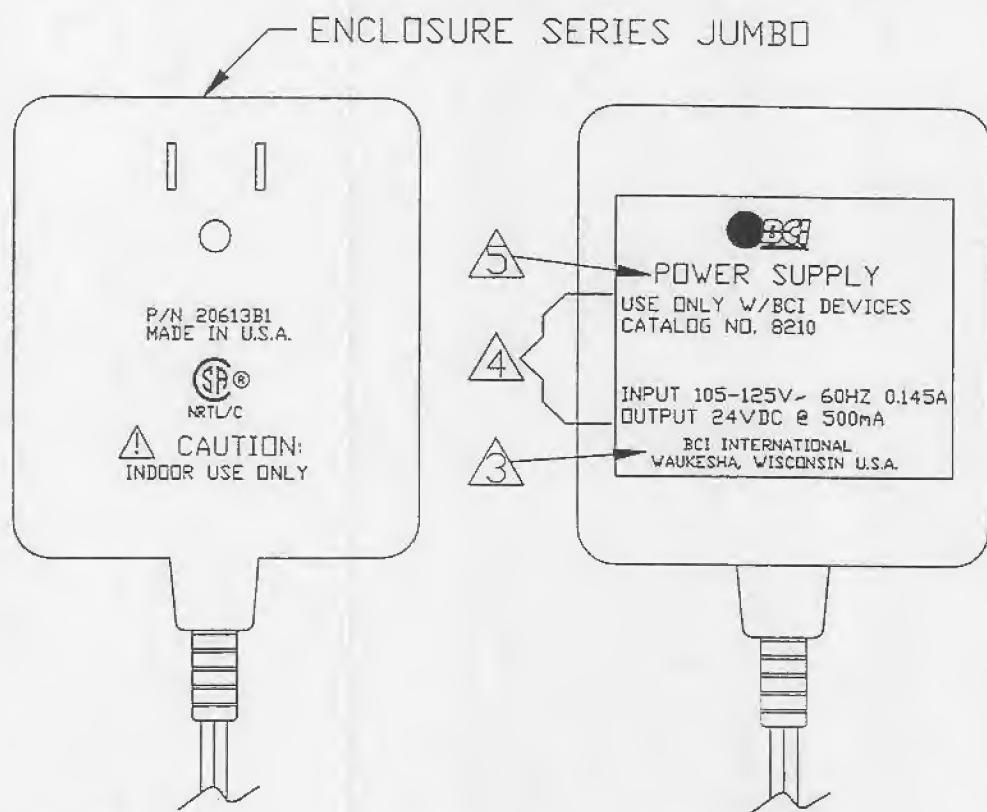
2 OF 2

B

REV.

NO. 1

Revisions



NOTES:

1. CHARGER TO BE HOT STAMPED ON BOTH SIDES WITH INFORMATION SHOWN. INK MUST BE ALCOHOL RESISTANT.
2. CORD TO BE TERMINATED W/EDS #00968 PLUG SHOWN BELOW.
3. LETTERING TO BE 6PT HELVETICA MEDIUM.
4. LETTERING TO BE 10PT HELVETICA MEDIUM.
5. LETTERING TO BE 14PT HELVETICA MEDIUM.

III. APPROVED MANUFACTURER:
EDS Model #8751

.098 dia.

0.216

1.5 max.

.433

ferrite

REMOVED LOT NO. BOX % NOTE 2, FOR
RENUMBERED NOTES, SEE HISTORY FOR
PREVIOUS REV. INFO. C/N 4024
1 MER 6-11-97

DRAWN BY DAU

APPROVALS

DWG.
NO.

20613B1

ISSUED 1-4-94

SHEET

2 OF 2



BCI INTERNATIONAL

DRAWING
NO.

20613B2

TITLE	CHARGER/POWER SUPPLY ISOLATED 24VDC OUTPUT/208-252V~ INPUT	DWG. CODE	SHEET	1	OF	3
		B	REV. NO.	2		

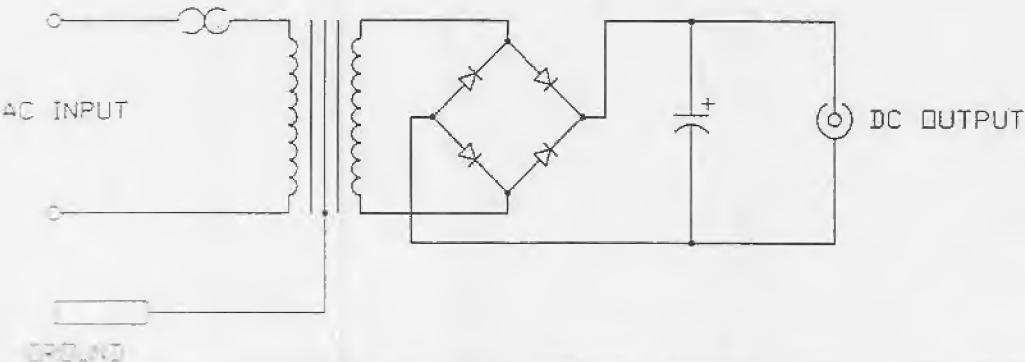
I. SPECIFICATIONS:

- A. Input Voltage 208-252V~
w/European Style Plug
with Ground Pin
- B. Frequency 50/60 Hz
- C. Output Voltage 24VDC @ 230VAC Input
- D. Output Current 500mA
- E. Isolation Requirements
Primary to secondary 4000V RMS
Primary to ground pin and shield 1500V RMS
Secondary to ground pin and shield 500V RMS
Shield construction to meet
IEC-601 (57.9.4 a&d) requirements
- F. Output Cord 20AWG, 6 ft. Lg. with
5.5mm X 2.5mm Plug
- G. Input Cord 18AWG, 6 ft. Lg. w/European
Style Plug with Ground Pin
- H. Construction Per IEC-601
- I. Charger Markings See Drawing (Sheet 2)
- J. Max. Temperature Rise 50° C
- K. Thermal Cutout 130° C, UL Rec. Component
in series with primary.
Elcut #U-23 or Elmwood
Sensors #WA128
- L. Windings
Primary 1860 turns of 34 AWG
Secondary 188 turns of 25 AWG
- M. Rectifier Full Wave Bridge
- N. Filter Capacitor 1000 uF 35V
- O. Fair-Rite core #2643023002 to be shrink-wrapped in place on
end of output cordset per dwg.

II. HIPOT TESTING

To be performed on each unit by the manufacturer

- A. 4800 VAC primary to secondary, 1 sec.



1	S.D.P. 3-1-96	WINDINGS WERE 1780 & 192 C/N 2410 SEE SHEET 2, C/N 4024
2	MER 6-4-97	

DESIGN BY D.SIEFERT	APPROVALS M.GEISLER 5-26-95	DWG. NO.	20613B2
5-4-94	J.M.PETER 5-26-95	D.SIEFERT 5-26-95	SHEET 1 OF 3

ORIGINAL



BCI INTERNATIONAL

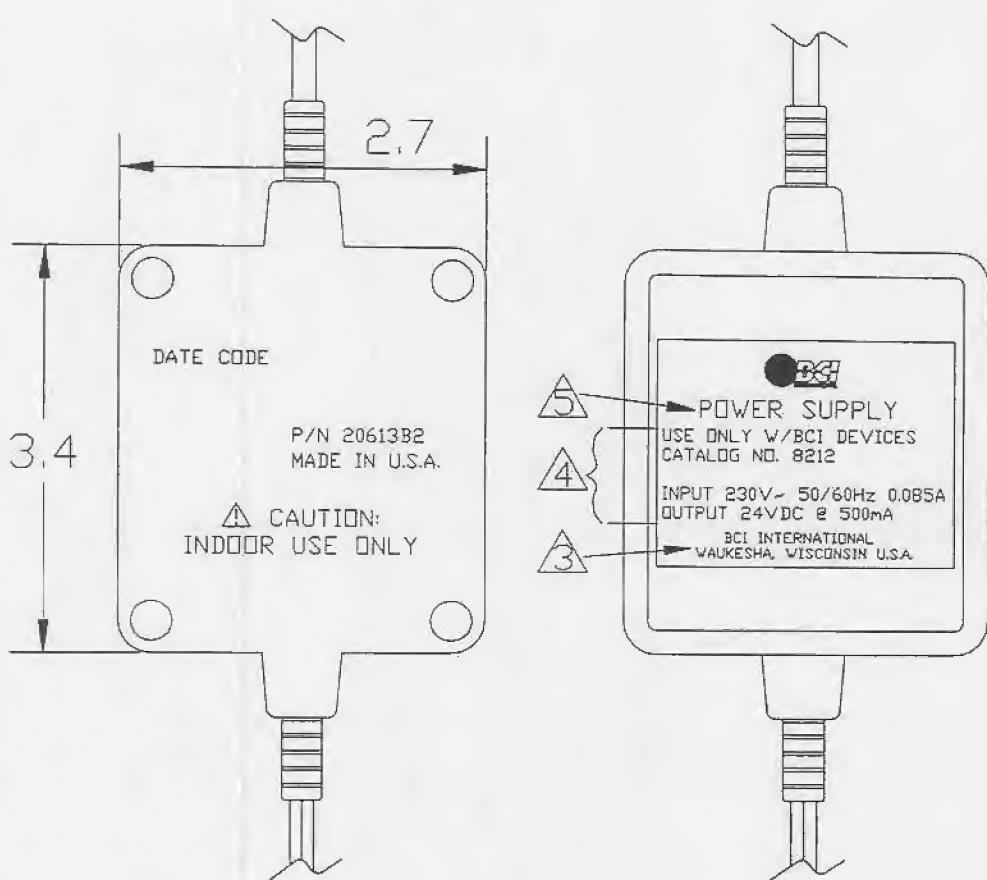
DRAWING
NO.

20613B2

TITLE

CHARGER/POWER SUPPLY ISOLATED
24VDC OUTPUT/208-252V~ INPUTDWG.
CODE

SHEET 2 OF 3

B REV.
NO. 2

NOTES:

1. CHARGER TO BE HOT STAMPED ON BOTH SIDES WITH INFORMATION SHOWN. INK MUST BE ALCOHOL RESISTANT.
2. CORD TO BE TERMINATED WITH PLUGS PER SHEET 3.
3. LETTERING TO BE 6PT HELVETICA MEDIUM.
4. LETTERING TO BE 10PT HELVETICA MEDIUM.
5. LETTERING TO BE 14PT HELVETICA MEDIUM.

DRAWN BY	DAU	APPROVALS	DWG. NO.	20613B2
ISSUED	1-4-94		SHEET	2 OF 3

1	SDP 3-1-96	SEE SHEET 1 C/N 2410
2	MER 6-4-97	REMOVED LOT NO. BOX & NOTE 2 RENUMBERED NOTES. C/N 4024



BCI INTERNATIONAL

DRAWING
NO.

20613B2

TITLE

CHARGER/POWER SUPPLY ISOLATED
24VDC OUTPUT/208-252V~ INPUTDWG.
CODE

SHEET

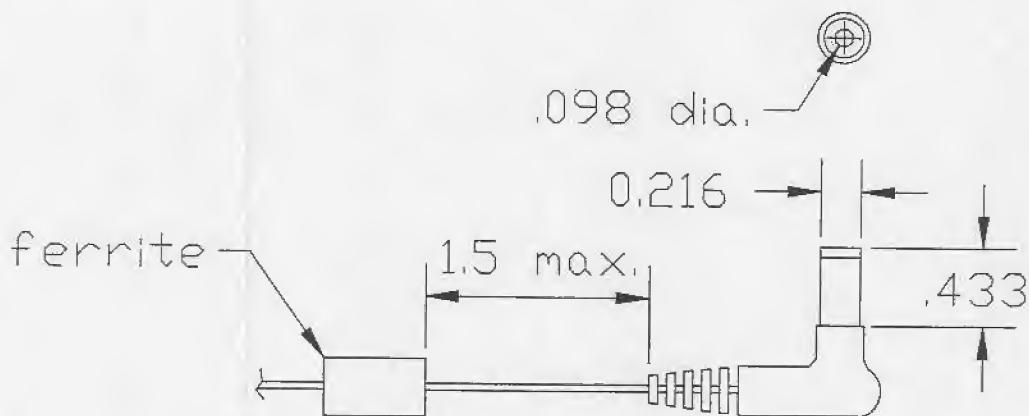
3 OF 3

B

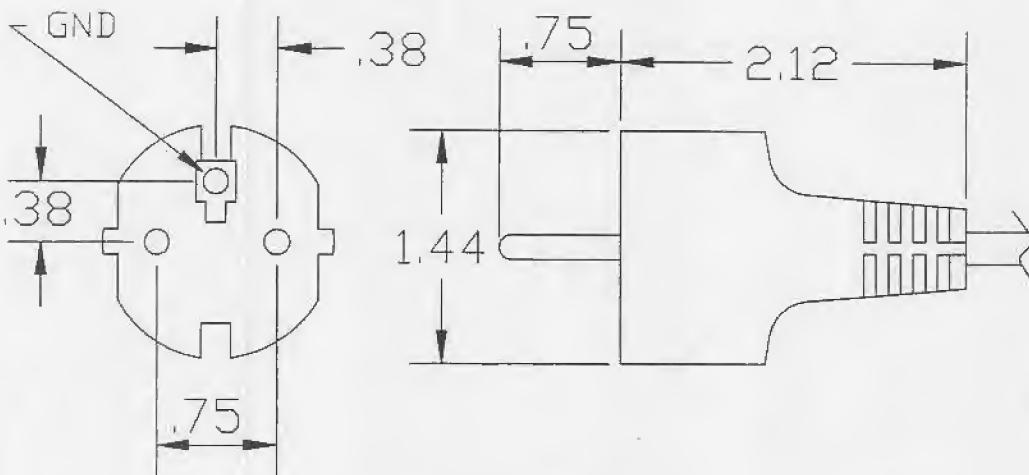
REV.

NO. 2

Revisions



Output Plug (#00968)



Wall Plug

III. APPROVED MANUFACTURER:
EDS Model #8826

DRAWN BY	DAU	APPROVALS	DWG. NO.	20613B2
ISSUED	1-4-94		SHEET	3 OF 3

1	SDP 3-1-96	SEE SHEET 1 C/N 2410
2	SDP 3-1-96	SEE SHEET 2 C/N 4024

BCI INTERNATIONAL		DWG. NO.	20613B3
CHARGER/POWER SUPPLY ISOLATED 24VDC OUTPUT/90-110V~ INPUT		DWG. CODE	SHEET 1 OF 2
		B	REV. NO. 2
I. SPECIFICATIONS: A. Input Voltage B. Frequency C. Output Voltage D. Output Current E. Isolation Requirements Primary to ground pin Primary to Secondary Secondary to ground pin F. Output Cord G. Construction H. Charger Markings I. Max. Temperature Rise J. Thermal Cutout K. Windings Primary Secondary L. Rectifier M. Filter Capacitor N. Fair-Rite core #2643023002 to be molded into place on end of output cordset per dwg. N. Fair-Rite core #2643023002 to be molded into place on		90-110V~ w/U.S. Standard Ground Pin 50 Hz 24VDC @ 120VAC Input 500mA 1500V RMS 2500V RMS 2500V RMS 20AWG, 6 ft. Lg. with 5.5mm X 2.5mm Plug Per UL-544 and CSA C22.2 NO. 125 See Sheet 2 50° C 130° C, UL Rec. Component in series with primary. Elcut #U-23 or equiv. 780 turns of 23 AWG 174 turns of 23 AWG Full Wave Bridge 1000 uF 35V	
II. HIPOT TESTING To be performed on each unit by the manufacturer A. 4800 VAC primary to secondary, 1 sec. B. 1500 VAC primary to core, 1 sec. C. 800 VAC secondary to core, 1 sec.		SEE SHEET 2, C/N 4024 MER 6-11-97 2	
DRAWN BY DRH	APPROVALS M.S.GEISLER	DWG. NO.	20613B3
ISSUED 8-17-94	J.M.PETER 5-26-95	SHEET 1 OF 2	

ORIGINAL



BCI INTERNATIONAL

DRAWING
NO.

20613B3

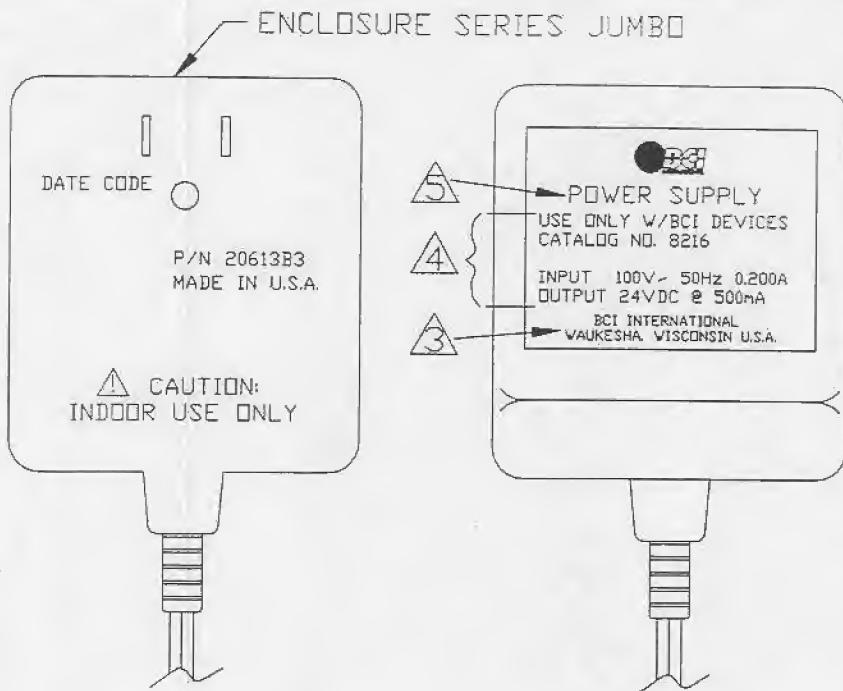
TITLE	DWG. CODE	SHEET	OF	REV. NO.
		2	2	

CHARGER/POWER SUPPLY ISOLATED
24VDC OUTPUT/90-110V~ INPUT

B

2

Revisions



NOTES:

1. CHARGER TO BE HOT STAMPED ON BOTH SIDES WITH INFORMATION SHOWN. INK MUST BE ALCOHOL RESISTANT.
2. CORD TO BE TERMINATED WITH PLUG #00968 SHOWN BELOW.
3. LETTERING TO BE 6PT HELVETICA MEDIUM.
4. LETTERING TO BE 10PT HELVETICA MEDIUM.
5. LETTERING TO BE 14PT HELVETICA MEDIUM.

III. APPROVED MANUFACTURER:
EDS Model #9011

.098 dia.

0.216

.433

1.5 max.

ferrite

REMOVED LOT NO. B0X 1 NOTE 2
RENUMBERED NOTES. SEE HISTORY FOR
PREVIOUS REV. IN Q. C/N 4024

2 MER 6-11-97

DRAWN BY SRH	APPROVALS	DWG. NO.	20613B3
8-17-94		SHEET	2 OF 2

ORIGINAL